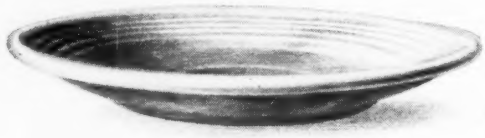
CERAMIC ABSTRACTS and THE BULLETIN

OF THE

AMERICAN CERAMIC SOCIETY

MAY 15, 1944

MONTHLY PUBLICATION DEVOTED TO THE ARTS AND SCIENCES RELATED TO THE SILICATE INDUSTRIES



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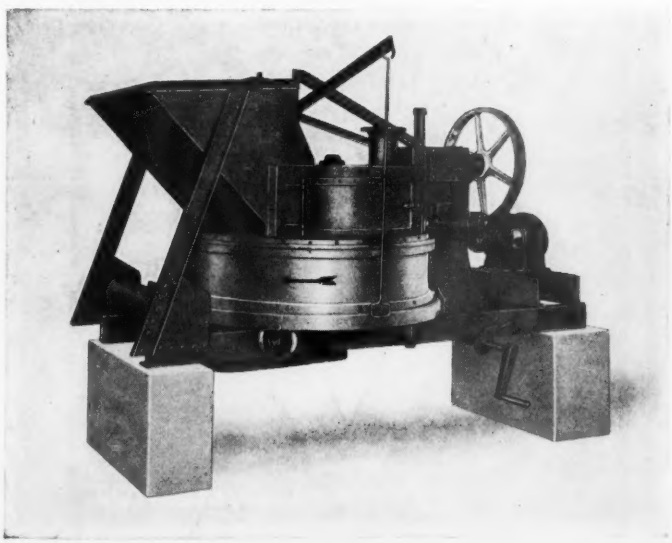

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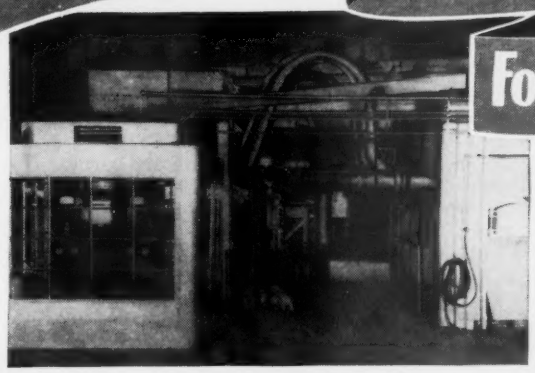

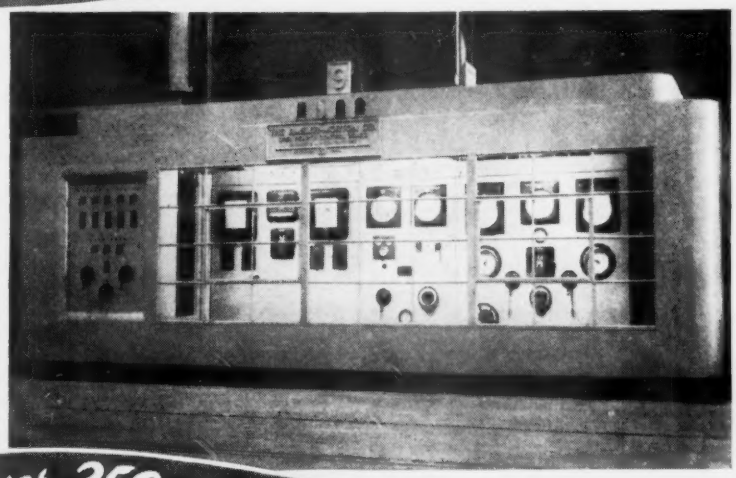

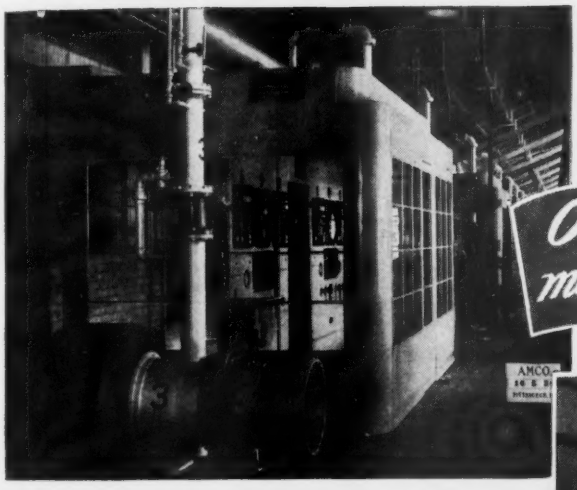

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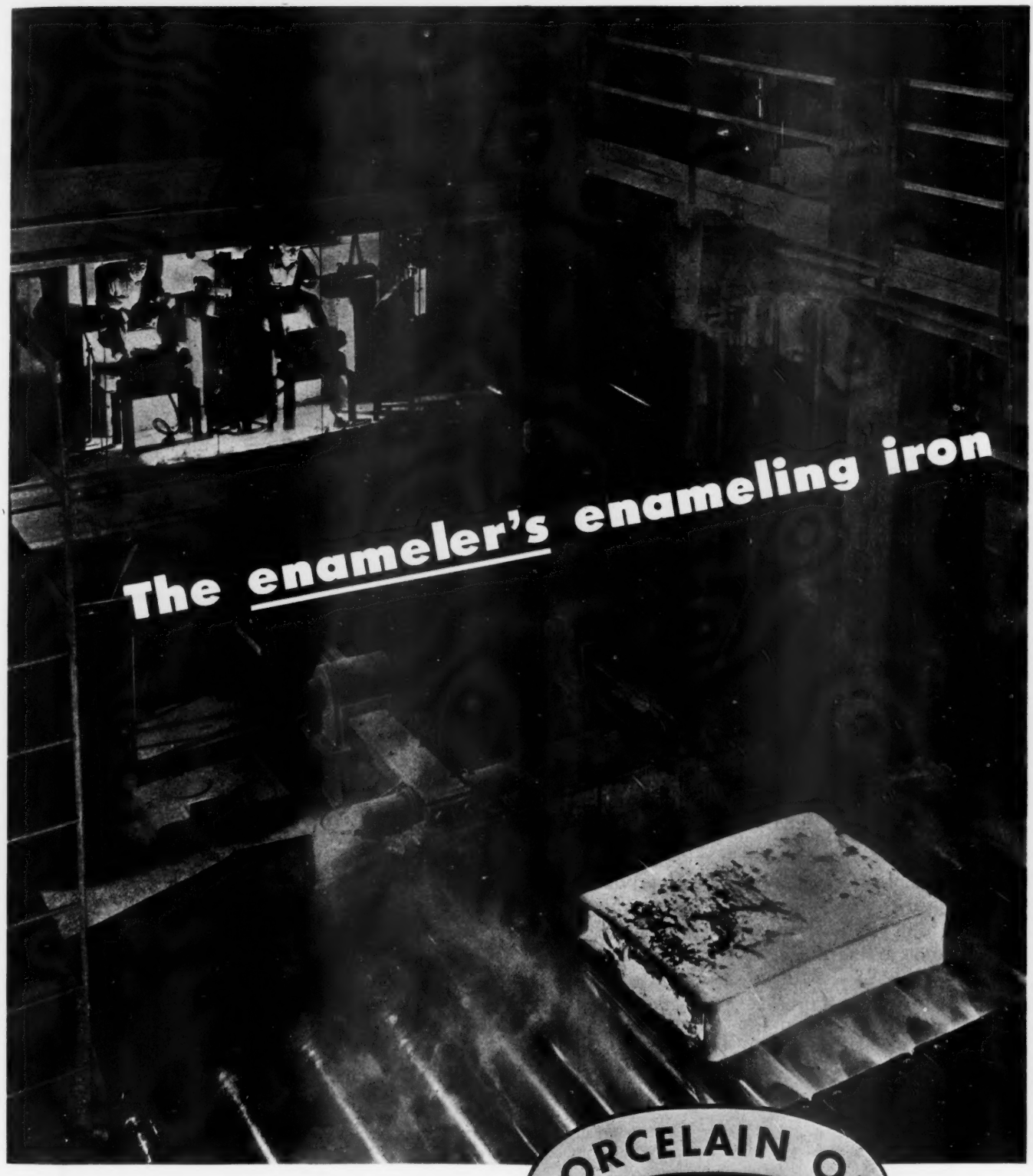

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Even under these conditions the operator reports that the "Carbofrax" setters remain practically free from warpage and cracking. Thus placing is facilitated—the need for frequent replacements is eliminated—ware rejections due to warpage are held to a minimum.

Furthermore, the relatively thin, high strength "Carbofrax" tile permit loading the cars to capacity, thereby increasing production and reducing the burning cost per dozen.

Regardless of the type of ware being handled it will pay you to investigate the advantages resulting from the use of "Carbofrax" superstructure in your kilns. The Carborundum Company, Refractory Division, Perth Amboy, N. J.

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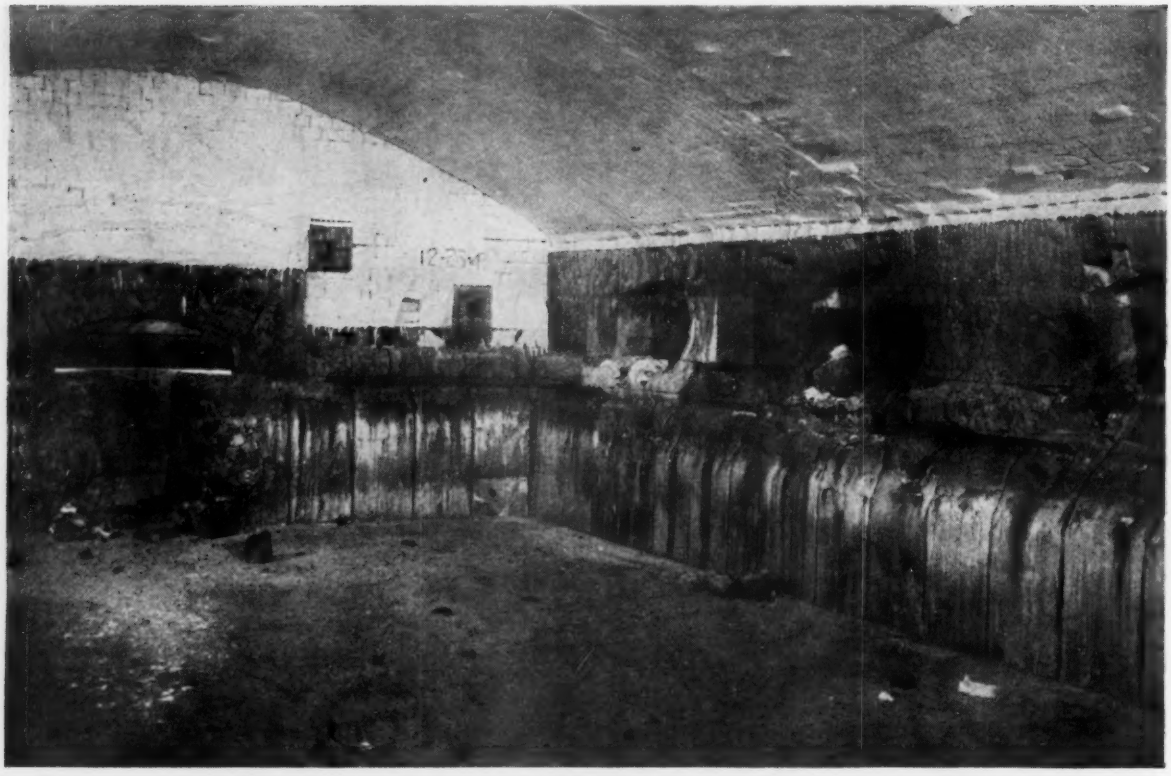

ANOTHER INTERESTING CORHART REPORT

LAST month we published four pictures of a Corhart* Electrocast tank which had run 1199 days and produced 104,890 tons of flint and amber glass (153.3 tons produced per square foot per life).

We thought you might want to study the detailed figures. So here they are:

TOTAL DAYS LIFE	1199
TOTAL IDLE DAYS	48
TOTAL OPERATING DAYS	1151
TOTAL TONS GLASS PRODUCED (FLINT AND AMBER)	104,890.78
AVERAGE DAILY TONNAGE LIFE	87.48
AVERAGE DAILY TONNAGE OPERATING DAYS	91.13
SQ. FT. PER TON LIFE	7.82
SQ. FT. PER TON OPERATING DAYS	7.50
TONS PRODUCED PER SQ. FT. PER LIFE	153.35

This furnace was built of Corhart Electrocast throughout the melting and refining-end sidewalls, throat, doghouse and breastwalls, plus outer course bottom blocks in the melting and refining ends, and a section of bottom in front of the doghouse. All blocks were Corhart Standard except the throat, several superstructure shapes and two melting-end sidewall blocks beneath the No. 1 port, which were Corhart Zed. (Note the two Zed sidewall blocks shown in the photograph). The furnace operated approximately four months on flint bottle glass, after which it was changed over to amber.

The furnace *did not fail.* No patch blocks or waterjackets were used at any time on Corhart materials. At the conclusion of the campaign it was found that the furnace could have been operated for several additional months.

Corhart Refractories Company, *Incorporated,* 16th and Lee Streets, Louisville 10, Kentucky.

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THE AMERICAN CERAMIC SOCIETY

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PERIODICAL REFERENCE: The name of the periodical appears in italics, followed by the volume (bold-faced), issue number (in brackets), page numbers, and year (in parentheses).

Vol. 23 **May 15, 1944** **No. 5**

Abrasives

Cylindrical grinder (Newall Type L). ANON. *Ind. Diamond Rev.*, **4** [39] 36 (1944).—The cylindrical grinding machine (Newall Type L) is designed for rapid and accurate production. The table and wheel-head movements are hydraulically controlled. The spring-loaded tailstock spindle can be fitted with a diamond tool for truing the wheel. Two independent hydraulic systems for the wheel feed are provided. A strong wheel head ensures vibrationless operation. As special attachments, a radius truing device and an angular truing attachment are supplied. P.G.

Dressing tools without diamonds. Range of application and operation as specified by VDI working schedule 3003. ANON. *Z. Ver. Deut. Ing.*, **87** [37/38] 590–92 (1943).—The scarceness of diamonds in Germany makes advisable the use of diamond-free wheels for as many grinding and dressing processes as possible. Because of its great hardness, the dressing diamond is used as a cutting tool for cutting through the grain and shearing it off, but it is broken off in the rotating grinding machine. The surface quality of the dressed piece therefore differs as shown in the table.

		Roughness (μ) (approximate) Dressing wheels of			
Grinding wheels	Material	Dressing diamond	Ceramic materials	Hard metal	Steel
Standard corundum, ceramic bond	Hardened steel	1	1	1.5	2
Grain size 46–80, hardness J–M	Unhardened steel	1.5	1.5	1.8	2.5

Operating conditions and maintenance are discussed. Special attention must be given to the bearings, which must run without noticeable play and be carefully protected from grinding dust. Dressing can be dry or with coolants; in the first case, the wheel must be cleaned by subsequent washing. Dressing wheels of hard metal are sensitive to coolant splashes and must be protected. M.HA.

Highly dispersed abrasive powders. M. I. KOĬFMAN. *Trudy Vsesoyuz. Nauch.-Issledovatel. Inst. Mineral. Syr'ya*, No. 146, pp. 111–21 (1939); abstracted in *Ind. Diamond Rev.*, **4** [39] 39–44 (1944).—K. gives suggestions for the standardization of sieve and subsieve sizes, using decimal geometric series (preferred numbers). The structure is discussed, and mechanical analysis provides a system of classification. The mineral composition, hardness, and wetting power of the abrasive powders are also discussed in detail. The improvements suggested include precision of classification, reduction in the pollution of the powders by large and small fractions, maximum homogeneity, and correct correspondence of the powders to a given nomenclature. P.G.

Properties of hard abrasives. IDR Data Sheet, No. 2. ANON. *Ind. Diamond Rev.*, **4** [39] 37 (1944).—The origin, chemical composition, purity, crystal system, cleavage, color, optical properties, fracture, surface, Mohs' scratch hardness, toughness, specific gravity, and application of the following abrasives are given in tabular form: glass, pumice, quartz, flint, garnet, agate, chalcedony, emery, corundum (natural and technical), silicon carbide, beryllium oxide, boron, boron carbide, and diamond. P.G.

Truing thread-grinding wheels. W. A. ATLEY. *Jour. Inst. Production Engrs.*, **22**, 251–64 (1943); abstracted in *Ind. Diamond Rev.*, **4** [39] 45–46 (1944).—Practical hints on the subject are given. In the case of the Matrix machine, two operations must be performed: the wheel face is trued parallel to the centers with a diamond, where the diamond is mounted on the tailstock and passed across the wheel face, and then an attachment mounted above the wheel with an annular grooved crushing roller is fed down to a preset stop to rest a few thousandths of an inch clear of the wheel face. The Matrix multiribbed truing attachment allows truing to a high degree of accuracy. The diamond profiles the thread on the grinding wheel while traversing. The disadvantages and advantages of diamond thread-grinding wheels are discussed. In the Wickman-Horstman machine, the crushing roller is of helical form (screw thread), and, as this form cannot be fed straight into the wheel, a preliminary grooving by means of a diamond is necessary. The wheel head must be set to the helix angle of the crushing roller. P.G.

Use of boron carbide as an abrasive. A. V. TIKHONOV. *Novosti Tekhniki*, **1940**, No. 11–12, pp. 9–11; *Chem. Abs.*, **35**, 865 (1941).—Its efficiency is 40 to 70% that of diamond dust, depending on conditions of use and the nature of the material. The product made in the Soviet Union is equal to that imported from Norton Co. in the U. S. The chief use is for grains of 10 μ or less. Grinding and grading procedures are given.

PATENTS

Abrasive wheels. NORTON GRINDING WHEEL CO., LTD. Brit. 559,356, March 1, 1944 (April 2, 1942).

Apparatus for truing grinding wheels. FERNAND TURRETTINI (Société Génevoise d'Instruments de Physique). U. S. 2,344,332, March 14, 1944 (Sept. 10, 1943).

Brake-shoe grinder. HJALMER THOMASON. U. S. 2,345,161, March 28, 1944 (June 30, 1941).

Broach and method of preparing. BRUCE CHANDLER AND H. B. YUEN (Pfanstiehl Chemical Co.). U. S. 2,344,-024, March 14, 1944 (Sept. 25, 1942).—A fired composition comprising approximately 25 to 50 diamond dust, 36.8 to 75 aluminum oxide, 0 to 10 bentonite, and 0 to 6% of zinc orthosilicate, the components being homogeneously distributed throughout the mass and the composition being adapted for use in grinding.

Buffing method or device. K. ROBINSON. Brit. 559,-372, March 1, 1944 (Aug. 11, 1942).

Centerless grinding or abrading machines. CHURCHILL MACHINE TOOL CO., LTD., AND H. LONGTHORPE. Brit. 559,604, March 8, 1944 (Oct. 14, 1942).

Cylinder-grinding tool. C. A. FULMER (Automotive Maintenance Machinery Co.). U. S. 2,345,930, April 4, 1944 (Feb. 18, 1942).

External-internal cylindrical grinding machine. C. G. FLYGARE AND H. A. SILVEN (Norton Co.). U. S. 2,344,242, March 14, 1944 (April 8, 1942).

Grinding device for drills. ROBERTS BLACK & CO., LTD., AND J. T. NEWBY. Brit. 559,483, March 8, 1944 (July 14, 1942).

Grinding machine. W. F. FRASER. U. S. 2,345,189, March 28, 1944 (March 25, 1942; Aug. 29, 1940).

Grinding machine work head. C. G. FLYGARE AND H. A. SILVEN (Norton Co.). U. S. 2,344,243, March 14, 1944 (April 8, 1942).

Grinding-wheel tool. G. J. BEAUDET (one-half to Max B. Stein). U. S. 2,344,385, March 14, 1944 (Dec. 14, 1942).

Lapping apparatus. D. A. WALLACE (Chrysler Corp.). U. S. 2,345,308, March 28, 1944 (Dec. 20, 1941); divided out of U. S. 2,314,533, March 23, 1943 (July 17, 1941).

Method and apparatus for grinding ball seats in steel articles. O. R. BRINEY, JR. U. S. 2,345,177, March 28, 1944 (May 21, 1942).

Method and apparatus for producing cutting and abrading articles. R. H. TAYLOR (J. K. Smit & Sons, Inc.). U. S. 2,344,066, March 14, 1944 (Aug. 4, 1942).—The method of forming a metal matrix with cutting and abrading particles embedded therein which comprises confining the particles in a mold and then introducing molten metal into the mold from beneath the particles.

Peripheral diamond abrasive wheel and method of making. GEORGE CROMPTON, JR. (Norton Co.). U. S. 2,343,-957, March 14, 1944 (April 2, 1942).—Method of making a grinding wheel comprising rotating a metal blank in a bath of molten metal while moving a supply of abrasive material in a continuous stream toward a surface of the metal blank which has a liquid film of metal from the metal bath and transferring the abrasive from the stream to the metal blank by electrostatic attraction.

Radius dresser for grinding wheels. F. S. BELLINGER. U. S. 2,343,949, March 14, 1944 (Feb. 18, 1941).

Radius and tangential surface grinding wheel dresser. S. J. KOPEC. U. S. 2,345,821, April 4, 1944 (Sept. 14, 1942).

Ring-grinding machine. R. M. SHAW, JR. (Pedrick Tool & Machine Co.). U. S. 2,344,371, March 14, 1944 (July 8, 1943).

Roll-grinding machines. CHURCHILL MACHINE TOOL CO., LTD., AND R. J. M. WHIBLEY. Brit. 559,610, March 8, 1944 (Oct. 29, 1942).

Segmental abrasive wheel. G. N. JEPPSON AND THURE LARSSON (Norton Co.). U. S. 22,457, March 14, 1944 (Dec. 18, 1943); reissue of original 1,865,523, July 5, 1932 (April 2, 1928).

Trimming mechanism for grinding wheels. R. J. BURROWS (Gear Grinding Co., Ltd.). U. S. 2,345,323, March 28, 1944 (Dec. 26, 1941).

Art and Archeology

Artless comment: Ceramics by Gregory. C. J. BULLIET. *Daily News* [Chicago], Feb. 19, 1944.—An exhibition of ceramics by Waylande Gregory, ceramic sculptor, is being held at the Museum of Fine Arts in Richmond, Va. He has steadily been broadening his work in clay and terra cotta to produce figures in which the form and design are powerful enough to escape subordination to the stylizing which is typical of many ceramic pieces. The exterior treatment of his sculptures varies from a natural unglazed finish to high glazes, transparent, transparent over painted designs, and crackled and colored glazes. Gregory believes that the glazes must "be of the form" of the work, not merely a covering, and instead of firing his pieces before and after the glazes are applied, the job is done in one operation. K.R.

Chemical corrosiveness of ceramic vitrifiable pigments. W. FUNK. *Keram. Rundschau*, **49**, 297–99 (1941); abstracted in *Chem. Zentr.*, **1941, II** [17] 2124.—The effect of raw vitrifiable pigments containing Pb on human gastric juice or fluids with similar acid content should be studied; only then can the so-called danger in production be understood clearly. Experiments were made on the action of annealed vitrifiable pigments on organic acids of varying concentration and at different temperatures, for the purpose of ascertaining the permanence and the danger to health. The so-called acid-fast colors varied in action according to their composition and treatment during firing. Strictly systematic principles must be followed if satisfactory results are to be obtained in the manufacture of acid-fast decoration, which must be able to withstand all the agents to which the ware may be exposed. M.V.C.

Munsell Color Foundation, Inc., established. ANON. *Bull. Amer. Ceram. Soc.*, **23** [4] 138 (1944).

Peasant potters of Beauce: New road to rural reconstruction. OSCAR BÉRIAU. *Bull. Amer. Ceram. Soc.*, **23** [4] 150–52 (1944).—6 illustrations.

PATENTS

Plate design. ALFRED DUHRSSEN. U. S. 137,489, March 21, 1944 (Jan. 19, 1944). U. S. 137,579, April 4, 1944 (Jan. 7, 1944). U. S. 137,585, April 4, 1944 (Jan. 13, 1944). U. S. 137,586, April 4, 1944 (Jan. 19, 1944).

Cements

Aluminate-silicate cement. D. I. MALEN'KIKH. *Prom. Stroitel. Materialov*, **1940**, No. 2, pp. 37–50; *Chem. Abs.*, **34**, 8202 (1940).—The normal mortar consistency is 40% for this cement compared with 28 to 31% for ordinary cements. The darker-colored cements require more time for setting than do the lighter-colored. The accelerated method of determining the activity of cement cannot be recommended, owing to a considerable decrease in the strength of autoclaved samples. Concrete made from the cement can be autoclaved at temperatures not exceeding 50°. The use of $CaCl_2$ lowers its strength and leads to a corrosion of the reinforcement. The cement is stable at low temperatures. The strength increases rapidly during the first 7 days and continues to increase after 28 days. This cement is not recommended for hydrotechnical construction.

***Evaluation of tested cements.** HANS ALBERT. *Tonind.-Ztg.*, **65** [33] 313–14 (1941).—A discussion of old and new DIN standards and methods of evaluating the results is presented. M.Ho.

***Hydraulic lime as binder for concrete.** W. KRONSBEIN. *Tonind.-Ztg.*, **65** [45] 431–32; [46] 445–46 (1941).—Sixteen kinds of limestone were tested, and their suitability for use in concrete was determined. The limestones varied widely in their chemical composition as well as in their physical properties. Tests were also made on the effect of trass and fly ash on the strength of test pieces made of lime. The effect of these additions on weak limestones was very marked. The strength of test pieces made of lime and trass or fly ash (1:1) increased at least 100%. The effect of these additions on the mechanically strong lime was considerably smaller. The addition of trass to mechanically strong lime had no effect on the resistance to pressure of test pieces made from this mixture. Fly ash did not raise the tensile strength of strong lime to the same extent as it did that of weak lime, but there was a marked increase in strength. The hydraulic limes were then tested in concrete. The addition of trass or fly ash had the same effect as it did on lime alone, i.e., both raised the strength of the concrete test pieces. Hydraulic limes with a normal strength of up to 40 kg. per sq. cm. are not suitable for use in concrete. If such limes are mixed with trass or fly ash, however, their mechanical properties are vastly improved and the mixture may be used in concrete for secondary parts. Hydraulic limes having a strength of at least 80 kg. per sq. cm. may be used in concrete for certain purposes without additions, but the adding of trass or fly ash gives better results. Hydraulic limes with a strength of 100 kg. per sq. cm. may safely be used in concrete without any additions, but even these are improved when mixed with trass or fly ash. The ameliorating effect of these additions diminishes as the physical properties of the lime improve. M.Ho.

***Revision of standards for Portland cement, ferruginous Portland cement, and blast-furnace cement. DIN 1164. Outline 1941.** *Tonind.-Ztg.*, **65** [49] 473–77 (1941).—Proposed alterations in old standards and some new concepts pertaining to nomenclature, identification, and definition of Portland cement, ferruginous Portland cement, and blast-furnace cement are presented. A sieve test, setting, strength, etc., are considered. M.Ho.

***Water content of the raw meal in cement calcining.** E. ROCK. *Tonind.-Ztg.*, **65** [51] 495–96 (1941).—It is customary in some cement-calcining plants to add water to the raw meal. The amount of water is 8 to 15% in the dry process and up to 40% in the wet process. In the case of shaft furnaces and Lepol furnaces, the water is added to induce granulation. In the wet process the water remains from previous treating. The addition of water to material calcined in a rotary kiln is a debatable question. The water lays the dust, but the expectation of an increased output is not justified. Furthermore, there is the additional heat requirement. R. calculated the additional heat requirement for 0, 12, and 40% moisture content in the calcined material. This was then translated in terms of cost. It is clearly seen that the cost goes up. R. then computes the increase in the cost of calcining when coal is used and the heat in the waste gases is reclaimed. Where coal is used the cost goes up still higher. It remains to be considered, therefore, whether the decreased content of dust in the fly ash and a potential increase in the output of the rotary kiln balance the increased cost of production. M.Ho.

White cement of the Keene type from Artemovsk gypsum. M. V. ALEKSEEV. *Keramika*, **1939,** No. 9, pp. 36–41; *Chem. Abs.*, **34,** 4535 (1940).—A stronger cement was obtained from batches with calcined gypsum containing K_2SO_4 because of the formation of double salts with $CaSO_4$ contained in the kaolin.

X-ray studies on calcium silicates. KEI-ITI AKIYAMA. *Waseda Applied Chem. Soc. Bull.*, **17** [3] 117–24 (in English, 139) (1940); *Chem. Abs.*, **35,** 4653 (1941).—Four kinds of calcium silicate, $CaO \cdot SiO_2$, $3CaO \cdot 2SiO_2$, $2CaO \cdot SiO_2$, and $3CaO \cdot SiO_2$, were prepared by heating a mixture of $CaCO_3$ and SiO_2 in a platinum crucible. $CaO \cdot SiO_2$ was easily synthesized by heating the mixture at 145° for 1 to 2 hr. In the product, the α and β types of crystals were recognized, and they were analyzed by the Debye-Scherer method. In the $2CaO \cdot SiO_2$ product, α, β, and γ types were obtained, instead of α and β or α and γ as formerly thought. $3CaO \cdot 2SiO_2$ was prepared by heating the mixture of $3CaCO_3$ and $2SiO_2$ at 1475° for 2 hr. The product thus prepared showed a typical X-ray diffraction pattern of its own. $3CaO \cdot SiO_2$ was also obtained in relatively pure form, and it was analyzed by X rays. The X-ray diffraction data are presented for all four calcium silicates. See *Ceram. Abs.*, **20** [8] 205 (1941).

PATENTS

Hydraulic cement compositions. SEMTEX, LTD., L. H. GRIFFITHS, AND W. SAUL. Brit. 559,541, March 8, 1944 (Aug. 20, 1942).

Producing Sorel cements. JOSEF BERLEK (vested in the Alien Property Custodian). U. S. 2,344,387, March 14, 1944 (June 20, 1939).—The method of producing a Sorel cement in which the basic magnesia constituent is made from naturally occurring crystalline magnesite having such a high ferrous iron content that Sorel cement containing the magnesia, if produced from the magnesite by burning under oxidizing conditions, would be injured by the oxidation of the iron to the ferric state, which method comprises calcining such magnesite having such a high ferrous iron content at a temperature sufficiently high to produce caustic burned magnesia, continuously during such calcining operation introducing a stream of reducing gas to maintain the material in a reducing atmosphere and produce caustic burned magnesia in which substantially all of the iron due to reducing atmosphere is present in the ferrous state, and mixing the so-calcined caustic burned magnesia with a soluble magnesium salt to give a high quality of Sorel cement.

* Obtained from microfilm.

Enamel

Boron-free sheet ground enamels. E. BAYER. *Glashütte*, **71,** 399–400 (1941); abstracted in *Chem. Zentr.*, **1941, II** [17] 2123.—Three boron-free frits were derived from a boron enamel, and the original feldspar enamel was changed into a quartz glass enamel. The frits could be smelted only long enough to completely fuse all the raw materials. Separate minute particles of quartz can be detected by the "thread test." M.V.C.

Can sheet or cast-iron enamels profitably replace nickel plating or chromium plating? A. KRAFFT. *Keram. Rundschau*, **49,** 359–60 (1941); abstracted in *Chem. Zentr.*, **1941, II** [26] 3230.—Enamel (dry dip enamel) is recommended as a substitute for nickel and chromium plating. The technical difficulties are explained. M.V.C.

Degreasing or acid pickling in sheet enameling. A. KRAFFT. *Keram. Rundschau*, **49,** 379–81 (1941); abstracted in *Chem. Zentr.*, **1941, II** [26] 3230.—Methods of chemical degreasing do not work out well in the case of enamels with low borax content. M.V.C.

Electromagnetic method of determining enamel thickness. K. AZAROV AND N. KHARCHENKOVA. *Zavodskaya Lab.*, **8,** 508–12 (1939); *Chem. Abs.*, **34,** 233 (1940).—The method is based on changes in the magnetic resistance of a closed circuit containing an electromagnet and the enameled specimen. The thickness of the layer is estimated by current changes in the coil of the electromagnet. The measurements are made regardless of the thickness of the iron sheet. The disadvantage of the method (a Cu oxide rectifier is used) is the effect of the outside tempera-

ture. The apparatus may be used for laboratory control work, but corrections should be made for the surrounding temperature. A diagram of the setup and the results of tests are given.

Enameled Utensil Manufacturers' Council tentative standard solubility test for porcelain enameled cooking utensils. F. A. PETERSEN AND A. I. ANDREWS. *Jour. Amer. Ceram. Soc.*, **27** [4] 113–15 (1944).—3 references, 4 figures.

Enameler's clay. B. M. SCHOLZ. *Glashütte*, **71**, 558–60 (1941); abstracted in *Chem. Zentr.*, **1941, II** [26] 3230.—The clay minerals (kaolinite, montmorillonite, beidellite) are discussed generally. It is emphasized that the most suitable enameler's clay is one that is medium fat and has little shrinkage on drying. The elutriating test is not conclusive for the evaluation of an enameler's clay because salts which have been lixiviated are not taken into consideration. Tests with a viscosimeter showed that when the addition of alkalis (soda, caustic soda) is increased, the clay is liquefied. The effect of Na water glass was less clear. M.V.C.

Fish-scaling in sheet ground enamels. W. KERSTAN. *Sprechsaal*, **74**, 263–65, 272–74, 279–80 (1941); abstracted in *Chem. Zentr.*, **1941, II** [17] 2124.—Literature dealing with the formation of fish scales is reviewed. As ground enamels must have a thin liquid consistency during firing so that the gases generated can escape, systematic experiments were made to determine to what extent the composition of the enamels affects the viscosity. A clear-cut rule could not be established as to whether fish-scaling can be prevented above a certain viscosity, but a certain relationship between viscosity and the formation of fish scales was found to exist. The experiments showed the procedure for obtaining enamels of definite viscosity. The extent to which the differences in composition of ground enamels may condition their dissolving power for iron oxide during firing was not investigated, but this is shown to have a certain effect. M.V.C.

Heat-treatment of large steel forgings in controlled atmospheres. O. E. CULLEN. *Steel Processing*, **30** [3] 173–77 (1944).—C. describes batch-type furnaces equipped with gas-fired radiant-tube heating elements which are especially adapted for production heat-treating of large forgings under careful atmosphere control. The furnaces have a capacity of 3675 lb. of steel forgings at temperatures up to 1759°F. 3 tables, 4 photographs. M.R.

Majolica enameling on cast iron by the dry or wet process? ANON. *Sprechsaal*, **74**, 360–63 (1941); abstracted in *Chem. Zentr.*, **1941, II** [26] 3230.—Majolica enameling by the dry process is better than wet enameling for the most important properties. M.V.C.

Opacification of glazes and enamel with zirconium compounds. K. AZAROV AND L. FAĬNRIDER. *Zhur. Priklad. Khim.*, **13**, 1414–15 (1940); *Chem. Abs.*, **35**, 2688 (1941).—Zr concentrate was treated as follows: magnetic concentration, grinding and milling to fine powder, boiling with H_2SO_4 (density 1.56; 2 cc. per gm. of ore) for 2 to 2.5 hr., washing, drying, calcining at 800° to 850°, and final powdering. The Zr opacifier obtained, in the amount of 6%, was mixed (milled) with white frit and applied to ceramic ware. The determination of acid stability, thermal stability, and mechanical durability showed that the enamel coating with Zr opacifier produced as white a surface as the coating containing PbO.

Pemco Corporation doubles laboratory facilities. ANON. *Bull. Amer. Ceram. Soc.*, **23** [4] 139 (1944).

Relationship between chemical composition and degree of fluidity of enamels. WALTER KERSTAN. *Emailwaren-Ind.*, **18**, 65–67, 69–72, 75–78 (1941); abstracted in *Chem. Zentr.*, **1941, II** [26] 3230–31.—A general discussion of the processes taking place during the softening of enamels is given, and K. suggests that the name, "temperature of softening," or "temperature of glost smelting," be selected for the actual reaction instead of the term, "melting point." The most important works on viscosity are discussed. The procedure of the experiments for determining the degree of fluidity of enamels is described. Many enamels were tested by means of this method, and it was determined that in different typical enamels the viscosity of a boron-free enamel almost corresponds to that of an enamel containing boron. Certain rules concerning the synthesis of enamels containing little or no borax were deduced from the experiments. Systematic experiments were made to study the effect of different raw materials on the liquefaction. M.V.C.

PATENTS

Luminous vitreous enamel. BENJAMIN ELECTRIC, LTD., AND G. D. SKINNER. Brit. 559,573, March 8, 1944 (Oct. 3, 1942).

Vitreous enameling. C. J. KINZIE AND D. S. HAKE (Titanium Alloy Mfg. Co.). U. S. 2,343,908, March 14, 1944 (July 28, 1937; March 18, 1940).—A white vitreous enamel containing as an opaquing agent a minor quantity of a zirconium oxide compound having an adsorbed carbon dioxide content in which carbon dioxide evolved during firing produces opacity.

Glass

Automatic control in the glass plant. JOHN L. DRAKE. *Glass Ind.*, **20** [3] 87–92, 94 (1939); *Chem. Abs.*, **33**, 7973 (1939).—Among the glass-plant operations under automatic control are batch weighing, handling, and mixing; furnace combustion, temperature, and pressure; the reversal of regenerative furnaces; and annealing-temperature control.

Chemical attack of glass by alkaline liquids and the effect of soluble ions on its action: I. W. GEFFCKEN. *Kolloid-Z.*, **86**, 11–15 (1939); *Chem. Abs.*, **33**, 2665 (1939).—Further results of an optical examination of the extent of attack of various grades of Jena glass by alkaline solutions (Na_2CO_3, Na_2S) are given in 5 graphs (see "Testing . . .," *Ceram. Abs.*, **18** [1] 18 (1939)). Preliminary tests show that the corrosion is greatly retarded in the presence of solutions of small amounts of K_2SiO_3 and chlorides and sulfates of bivalent and trivalent metals (Ca, Ba, Zn, Al, etc.). Salts of univalent cations (KCl) and HBO_2 do not inhibit the attack by alkalis. See "Chemical . . .," *ibid.*, [2] 45.

Coating of mirrors with aluminum and its advantages in astrophysical research. G. RIGHINI. *Notizie Labor. Sci. Ind.*, **42** [1] 23–26 (1942); abstracted in *Z. Instrumentenk.*, **63** [1] 31–32 (1943).—Deposition of Al vapors on mirrors in vacuum can now be applied to even larger surfaces so that investigations in the ultraviolet spectrum range up to $\lambda = 2900$ a.u. are now possible with large reflector instruments, especially for spectroheliograms in the light of the red H line Hα and of the ultraviolet line $\lambda = 3890$ a.u., as Al has a much greater reflectivity than Ag in the ultraviolet and the Al coating is much more durable than Ag and keeps the reflectivity longer. While an Ag mirror loses about 50% of its reflectivity in 100 working hr., the Al mirror with 80 to 85% of its original reflectivity remains constant for a much longer time. Where formerly a dispersion of about 3 a.u. per mm. only could be obtained, it is now possible to use 1.5 a.u. per mm., which makes possible a much sharper selection of spectral lines, especially line K_3 for sun surface analysis. M.HA.

Colors of stratified media: I, Ancient decomposed glass. C. V. RAMAN AND V. S. RAJAGOPALAN. *Proc. Indian Acad. Sci.*, **11A**, 469–82 (1940); *Chem. Abs.*, **35**, 289 (1941).—Flakes from an excavated ancient Syrian vase were examined. Twelve spectrograms and 9 photomicrographs are given. The glass consisted of thin laminas which were optically and mechanically continuous, but it had an open framework structure which was stratified or quasi-periodic. The flakes were usually of uniform thickness, and only at the edges where air penetration between strata seemed to occur did the color vary noticeably. The

stratifications are regular enough that the flakes either transmit but a limited region of the spectrum (usually the red) and totally reflect the rest or do just the opposite. At oblique angles of incidence and near the polarizing angle the colors vary with the azimuth of vibration but in opposite ways in the two cases given above. The fact that mechanical pressure causes the color to disappear permanently indicates destruction of structure. Immersion in liquids causes the color by transmitted light to disappear, but that by reflected light persists and even becomes more brilliant with liquids of high n. When n = 1.465, reflected color disappears and always diminishes in intensity as this value is approached. Aging, which seems to be the result of the gradual dissolving of the more soluble material, has evidently caused a lowering in the n. When drying occurs, the liquid withdraws from the larger cavities first and remains behind in the smaller pores. This gives the effect of increased optical stratification so that nearly total reflection occurs and the glass appears silvery white. Brewster's explanation of the color being due to films of air separating thin layers of glass is definitely refuted. See "Structure . . .," *Ceram. Abs.*, **20** [6] 142 (1941).

Corning Glass Works has Argentine plant. ANON. *Bull. Amer. Ceram. Soc.*, **23** [4] 139 (1944).

Crystals of quartz glass. N. A. SHISHAKOV. *Compt. Rend. Acad. Sci. U.R.S.S.*, **23,** 788–91 (1939) (in English); *Chem. Abs.*, **34,** 2669 (1940).—Zachariasen (*Ceram. Abs.*, **12** [4] 145 (1933)) and others, on the basis of X-ray diagrams, concluded that quartz glasses, SiO_2 or many-component glasses, are amorphous. S., using the electronographical method, believes quartz glasses to be crystal. The X-ray and the electronographical methods are discussed critically. The developed theory of two-dimensional or "scaly" crystals, consisting of sheets of Si_2O_5 with a periodicity of 7 to 8 a.u., is in agreement with Hartleif's value of 8.33 a.u.

Electrical conductivity in composite alkaline boric glasses: Li_2O–K_2O–B_2O_3; Li_2O–Na_2O–B_2O_3; Na_2O–BaO–B_2O_3. B. I. MARKIN. *Zhur. Tekh. Fiz.*, **10,** 66–78 (1940); *Chem. Abs.*, **34,** 7555 (1940).—Electrical conductivity (x) of these glasses is given by the relation $\log x = -A/T + B$, where T is the temperature and A and B are numerical coefficients. The electrical conductivity of the composite glasses containing large amounts of alkali ($8 < M < 10$) expressed as the function of the molar ratios of the two oxides has a sharp minimum for equal concentrations of both components. For the glasses with a small amount of alkali ($M = 3.3$) the minimum of electrical conductivity is considerably less sharp. The electrical conductivity of composite glasses with the two alkali oxides is in the first approximation equal to the sum of the electrical conductivities of two components. The minimum of electrical conductivity can be easily explained as the result of the additivity effect combined with the well-known decrease of electrical conductivity of simple glasses with the decreasing concentration of alkali. The plot of the electrical conductivities of the composite Na-Ba-B glasses against the molar content of BaO shows that, for small Ba content, the electrical conductivity of these glasses is equal to that of the simple system Na_2O–B_2O_3. For a BaO content higher than 40% (by weight), the Na conductivity decreases 100 times; this indicates a strong influence of high concentration of BaO on the mobility of the ions in glasses.

Electronics and the glass industry. H. C. STEINER. *Bull. Amer. Ceram. Soc.*, **23** [4] 140–46 (1944).—17 figures.

Experiments on the control of the homogeneity of glass batches by photometer curves of their X-ray pictures. HANS FREYTAG, U. HOFMANN, AND K. ENDELL. *Glastech. Ber.*, **19,** 185–91 (1941); abstracted in *Chem. Zentr.*, **1941, II** [17] 2124.—To determine inhomogeneities in glass batches, X-ray pictures of the ingredients of the mix were studied photometrically, and photometric curves were determined. Under the conditions of the experiments, fluctuations of $\pm 2.5\%$ were determined; in the case of the sharp interference produced by calcite, smaller differences were detected. When monochromatized X rays were used, the sensitivity was increased. A very uniform distribution of the batch ingredients was reached, even for the smallest constituents of the briquettes. M.V.C.

Fluorochemistry in military science. JACK DE MENT. *Jour. Chem. Education*, **21** [3] 116–25 (1944).—The application of fluorescent chemicals and fluorescent lighting to illumination problems in the various branches of the armed forces is discussed. In particular, the uses of fluorescence in the military and naval intelligence corps are mentioned. 8 references. S.Z.

Glasses containing chromic oxide: I. K. HUWA. *Jour. Japan. Ceram. Assn.*, **47,** 569 (1939); *Chem. Zentr.*, **1940, I,** 1727; *Chem. Abs.*, **35,** 6404 (1941).—In glasses containing SiO_2 72, CaO 12, and R_2O 16%, the CaO was replaced step by step with Cr_2O_3. When the Cr_2O_3 content of K- and Na-containing glasses was about 4%, the glass became difficult to work because of the black oxide remaining undissolved. By the use of Li_2O, a green aventurine glass containing 4% Cr_2O_3 was obtained. At 8% Cr_2O_3 this glass became very difficultly fusible; at 10% it was no longer a true glass. With the exception of the K-containing glass, which was light yellow in color, these glasses were all green. Absorption curves obtained for these glasses showed certain displacements both as to position and intensity of the absorption bands, depending on the alkali metal present.

Improving the quality of natural sulfate by preliminary treatment. M. D. TAMARIN. *Stekolnaya Prom.*, **1940,** No. 11–12, pp. 21–22; abstracted in *Chem. Zentr.*, **1941, II** [17] 2124.—Natural sodium sulfate contains more or less impurities (sand, shells, etc.) which render it unsuitable for use in glass plants; these inclusions usually cannot be sifted out because the material is damp and cakes badly. A process was worked out by T. in which the sodium sulfate is mixed with the soda required for the glass melt and the oxidizing agents (charcoal, etc.) and crushed in an edge mill. The hygroscopic admixtures absorb part of the water and prevent the mass from caking, thus making sifting possible. M.V.C.

Magnetic evidence regarding the state of metallic ions in phosphate glasses. S. S. BHATNAGAR, B. D. KHOSLA, AND RAM CHAND. *Jour. Indian Chem. Soc.*, **17,** 515–20 (1940); *Chem. Abs.*, **35,** 1197 (1941).—The nature of the multivalent ions of Mn, Co, and Ni in phosphate glasses was studied with the aid of measurements of the magnetic susceptibilities of these glasses. These measured values were compared with the susceptibilities calculated on the basis of different states of valency of these ions. The Mn in the reduced colorless glasses is in a bivalent state. The pink-violet color of Mn glasses is caused by trivalent Mn ions. The blue color of Co glasses is caused by bivalent ions of Co, and the yellow color of Ni glasses by bivalent Ni; hence, on reduction, Co glasses suffered no change in color, and Ni glasses became opaque masses which were ferromagnetic in nature, indicating the formation of metallic Ni. See *Ceram. Abs.*, **18** [10] 267 (1939).

New results in the measurement of the interior steaming of glass in buildings. K. SCHUSTER. *Glastech. Ber.*, **19,** 228–30 (1941); abstracted in *Chem. Zentr.*, **1941, II** [26] 3231.—The measuring device is described, and it is shown that the steaming effect depends only partly on the amount of traffic; it is inversely proportional to the latter. M.V.C.

Optical fluor-crown glasses. WALTER A. FRASER AND LEE O. UPTON. *Jour. Amer. Ceram. Soc.*, **27** [4] 121–28 (1944).—5 references, 10 figures.

Permanent labels for commercial glass containers. C. S. SIDEBOTTOM. *Can. Chem. & Process Inds.*, **23,** 541–42 (1939); *Chem. Abs.*, **34,** 599 (1940).—The silk-screen process for the application of fused-on colors is outlined. Permanent labels are applied to bottles by means of the silk-stencil process with a "paint" composed of powdered fusible color mixed with an oily resinous medium similar to a paint vehicle. The fusible coloring materials applicable to glassware are basically Pb silicate fluxes, usually containing other auxiliary ingredients, milled with calcined pigments. The preparation of color pastes and of silk screen and the application of the colors are outlined.

Precision instrument bearings molded of glass in new

process. J. H. Goss. *Product Eng.*, **15** [3] 170–73 (1944).—Glass ring jewel bearings were developed to meet the wartime shortage of sapphire bearings used for instruments in general, but especially for aircraft panel instruments. The small bearings are made of hard glass and are 0.051 and 0.076 in. in diameter. The impact tests were made using the moving elements of actual instruments, and the impact deceleration was measured in terms of the number of times gravity the bearings withstood impact without fracture or damage. Ring bearings have been made up to 0.5 in. outside diameter with holes as small as 0.005 in. in diameter. See "Glass jewels . . .," *Ceram. Abs.*, **23** [1] 9 (1944). M.Ha.

Present state and the future prospects of the glass industry. Karl Kasper. *Mécanique, Suppl. Tech. Ind. Chim.*, No. 284bis, pp. 37–38 (1939); *Chem. Abs.*, **33**, 7505 (1939).

"Quality" and "kinds" of glass. Anon. *Sprechsaal*, **74**, 330–32 (1941); abstracted in *Chem. Zentr.*, **1941, II** [26] 3231.—The meaning of the German terms is differentiated. M.V.C.

Replacing industrial materials in the acid grinding of glass. A. Ball. *Glastech. Ber.*, **19**, 225–28 (1941); abstracted in *Chem. Zentr.*, **1941, II** [26] 3231.—The substitution of artificial materials to save metals and hard rubber has been accomplished (in Germany). M.V.C.

Silicate glasses. Maurice L. Huggins. *Jour. Chem. Phys.*, **8**, 641 (1940); *Chem. Abs.*, **34**, 6421 (1940).—The volumes, refractions, and dispersions of well-annealed silicate glasses are simple additive functions of the compositions when these properties are calculated for the quantity of glass which contains 1 gm. atom of O and the compositions are expressed as numbers of atoms of the "metallic" elements per atom of O. See "Dispersion . . .," *Ceram. Abs.*, **20** [4] 88 (1941).

Sintered Pyrex brand and soft glass sections in tubes and crucibles. G. N. Quam and Johanna Henn. *Ind. Eng. Chem., Anal. Ed.*, **15** [12] 766 (1943).—The advantages of the construction of a sintered mat directly in a tube or crucible in one operation are discussed, and the procedure and technique for such construction are described. F.G.H.

Slag wool and rock wool as important substitute materials. H. Schmidt. *Stahl & Eisen*, **63** [18] 360–66 (1943).—Slag wool consists mainly (as do all blast-furnace slags) of lime-alumina silicates with varying contents of magnesia, S bound to lime, ferrous oxide, etc. When cooled slowly, slag solidifies in crystals; the solidification must, therefore, be made to take place rapidly to obtain a vitreously solidified slag. The slag wool is produced mainly by remelting the vitreous slag and blowing steam into it. Rock wool (mineral wool) is made similarly. The melting point of both wools is between 1300° and 1350°C., but sintering starts at 800° to 900°. As a heat insulator, slag wool can stand 850°C. continually without change in properties because it contains no organic substances or fuel residues; it does not burn nor is it inflammable. In humid air dry slag wool absorbs about 0.3 to 0.5% water in 24 hr. Neither slag nor rock wool are subject to corrosion by water or S. The heat conductivity of slag (or rock) wool for a density of 160 kg. per m.^{3} is, at 100°, 200°, 300°, and 400°C., 0.04, 0.05, 0.066, and 0.085 cal. per m. hr. °C., respectively. This wool may also be used as a packing by adding bituminous substances. M.Ha.

PATENTS

Apparatus for generating precision flat surfaces. Bausch & Lomb Optical Co. Brit. 559,474, March 1, 1944 (June 29, 1942).

Bullet-resisting glass. J. H. Fox (Pittsburgh Plate Glass Co.). U. S. 2,345,336, March 28, 1944 (Dec. 28, 1940).

Coating glass thread. W. M. Camp (Clark Thread Co.). U. S. 2,344,494, March 21, 1944 (March 14, 1940).

Cooling nozzle for hollow glassware. T. D. Green (Hartford-Empire Co.). U. S. 2,345,808, April 4, 1944 (June 5, 1942).

Manufacture of spun artificial fibers. Piero Modigliani and Valentino Wiquel (Owens-Corning Fiberglas Corp.). U. S. 2,344,892, March 21, 1944 (April 26, 1938).

Method of sealing glass to iron. A. J. Monack (Radio Corp. of America). U. S. 2,345,278, March 28, 1944 (Feb. 2, 1942).

Nozzle for the manufacture of mineral wool. M. E. Callander. U. S. 2,344,125, March 14, 1944 (July 8, 1940).

Revolving pot for glassware manufacture. A. G. Lauck (Owens-Illinois Glass Co.). U. S. 2,344,464, March 14, 1944 (July 16, 1942).

Tempering glassware. G. D. Mylchreest (Hartford-Empire Co.). U. S. 2,344,630, March 21, 1944 (Nov. 25, 1939).

Transmission film for glass. F. L. Jones (Bausch & Lomb Optical Co.). U. S. 2,344,250, March 14, 1944 (June 13, 1941).

Treatment of fibrous glass. H. W. Collins (Owens-Corning Fiberglas Corp.). U. S. 2,344,601, March 21, 1944 (Feb. 27, 1941).

Structural Clay Products

Chemical method of rendering harmless lime pebble in clay masses. L. M. Blyumen. *Keramika*, **1939**, No. 10, pp. 33–37; *Chem. Abs.*, **34**, 8194 (1940).—Lime contained in clay is converted to silicate by adding 0.7 to 1.0% NaCl to the batch; thus good brick is produced even with $CaCO_3$ up to 1.5%.

Relation between strength of brick, mortar, and masonry. Otto Drögsler. *Tonind.-Ztg.*, **62**, 573–75, 584–85 (1938); *Chem. Abs.*, **32**, 8721 (1938).—The bending or compressive strength of brick increased linearly with increase in bulk density. The strength of masonry increased linearly with the bending or compressive strength of brick and hyperbolically with the compressive strength of mortar. When the latter exceeds 75 kg. per sq. cm., the increase in strength of the masonry is relatively small.

Strength of brick made of deaired clay. Otto Drögsler. *Tonind.-Ztg.*, **63**, 665–66 (1939); *Chem. Abs.*, **33**, 9566 (1939).—A much better correlation between bending and compressive strengths than between tensile and compressive strengths was obtained.

Water-soluble constituents in brick and clays. F. Lipinski. *Tonind.-Ztg.*, **64**, 109–11, 125–27 (1940); *Chem. Abs.*, **34**, 7557 (1940).—Water-soluble constituents exist in a fired brick only in very small amounts. The soluble constituents in raw clay consist of (1) those which are soluble in H_2O because of their chemical character and (2) those which form colloidal solutions because of their fineness but are insoluble in their chemical nature. The first group contains NaCl, KCl, $MgCl_2$, sometimes $NaNO_3$ and KNO_3, and the sulfates of Na, Mg, K, and Ca. Chlorides and nitrates are easily disintegrated by heat. Chlorides may have a favorable effect, e.g., $CaCl_2$ is often added to the clay to prevent harm by frost. Efflorescences may destroy the mortar or plaster. Clays containing CaO are much more sensitive to the absorption of S compounds from combustion gases than are clays free from CaO. A reducing atmosphere and particularly a high firing temperature (1100° or over) helps to destroy sulfates.

Refractories

Action of alkalis on refractory materials: XVII, Cone-deformation study of certain alkali-silica-alumina and alkali-silica-alumina-ferric oxide mixtures. F. H. CLEWS, H. M. RICHARDSON, AND A. T. GREEN. *Bull. Brit. Refrac. Research Assn.*, No. 63, p. 1 (1942); reprinted in *Rept. Refrac. Materials Joint Comm., 33d Rept., Gas Research Board Commun.*, No. 7, pp. 9–12 (Sept., 1942).—Parts of the systems Na_2O–Al_2O_3–SiO_2 and K_2O–Al_2O_3–SiO_2 containing up to 30% R_2O, up to 50% Al_2O_3, and down to 40% SiO_2 were studied by the cone-deformation method. Examinations were made of the effects produced by additions of 2 and 5% Fe_2O_3. In many mixtures reaction was slow, and repeated meltings with intermediate grindings and rebondings were necessary for consistent results. Final temperatures of cone deformations were in general agreement with the phase diagrams of these systems at present available. Data obtained are in agreement with conclusions of earlier reports on conditions causing softening or embrittlement through the action of alkalis on silica and fire-clay materials. For Part **XVI** see *Ceram. Abs.*, **21** [10] 212 (1942); **23** [4] 72 (1944). P.S.D.

Aluminum from clay. ANON. *Science News Letter*, **45** [10] 147 (1944).—Aluminum may be produced from clay at a cost that will compete with that of its manufacture from bauxite. Experts believe that there are localities where suitable high-alumina clay, limestone, and coal occur in large quantities within economical radius. G.A.K.

***Behavior of refractory materials in lime-burning shaft furnaces.** K. LITZOW. *Tonind.-Ztg.*, **65** [55] 535–37; [56] 548–49; [57] 556–58 (1941).—The corrosive effect of lime on refractories was tested on fourteen different industrial refractories. The tested refractories were silica brick, 7 kinds of chamotte, corundum-containing brick, sillimanite, bauxite brick, 2 kinds of magnesite, and chrome magnesite. Five kinds of limestone were used in these experiments. Detailed analyses of the refractories and the limestones are given. The following points were investigated: (1) the effect of (*a*) temperature, (*b*) various limestones, and (*c*) chemical composition on the furnace lining; (2) the effect of the structure of the brick (porosity); and (3) the effect of coal added to the limestone. Excepting magnesite, all the refractories were corroded by the lime. The chemical composition of the refractories had practically no effect on their susceptibility to corrosion. Brick with 25% Al_2O_3 had the same resistance as brick with 45% Al_2O_3. The density, structure, and strength proved of greater importance than the Al_2O_3 content. As it is easier to produce a dense structure when the Al_2O_3 content is smaller, it follows that such brick is more resistant than brick with a high Al_2O_3 content. A high Al_2O_3 content becomes superior only when it can be given a dense structure. To insure satisfactory ware, ordinary chamotte brick should be used at a temperature not exceeding 1200°–1250°. Above this temperature special refractories should be used. Silica brick proved very resistant where pure limestone was used. Al_2O_3 in the limestone lowers the resistance of silica brick considerably. The silica brick was quite susceptible to thermal changes. Where the temperature dropped to below 500°, this drawback became very noticeable. If such temperature drops can be avoided, the silica brick is preferable to the chamotte. Bauxite-, corundum-, and sillimanite-containing refractories proved exceedingly resistant chemically. Their cost, however, is considerably higher. It should be pointed out that their service life is so much longer that it may possibly balance the increased cost. The most resistant chemically was magnesite. Its susceptibility to temperature changes is a great drawback. It should also be remembered that besides the chemical resistance the resistance to abrasion may be greatly affected by temperature. The experimental results are in good agreement with the phase diagram of the system CaO–Al_2O_3–SiO_2. After these experiments, 19 other chamotte materials were tested. The results of these tests corroborate the results of the earlier tests. Further work is contemplated. M.Ho.

Behavior of refractory materials under stress at high temperatures: III, Experiments on porcelain in tension and in torsion. F. H. CLEWS, H. M. RICHARDSON, AND A. T. GREEN. *Bull. Brit. Refrac. Research Assn.*, No. 63, p. 61 (1942); reprinted in *Rept. Refrac. Materials Joint Comm., 33d Rept., Gas Research Board Commun.*, No. 7, pp. 59–75 (Sept., 1942).—Experiments on the deformation of porcelain were continued, using tensile and torsional stress at temperatures of 900° to 1100°C. The empirical expression

$$S = kS_0 + kA(1 - e^{\lambda\sqrt{t}}) + k^nBt$$

has been found to apply for the deformation for periods up to about 15 hr., where k is the load, t is the time, S_0, A, λ, and B are constants, and n is about 2. The first term represents the elastic deformation, which is instantaneous and recoverable immediately on removing the stress; the second term is the viscous-elastic deformation, which is slowly recoverable; and k^nBt represents a pseudoviscous deformation, which is irrecoverable. The viscous-elastic term is the same as that suggested by A. A. Michelson and found by V. H. Stott to apply to glass. Stress and time hardening occur over extended periods of time. For Parts **I** and **II** see *Ceram. Abs.*, **21** [10] 213 (1942). P.S.D.

Cryolite and the electrolytic production of aluminum. GIUSEPPE AGNINI. *Chimica & Industria* [Italy], **22**, 209–14 (1940); *Chem. Abs.*, **35**, 3905 (1941).—The percentage of F in cryolite varies, and this variation becomes more marked on fusion of the cryolite. According to A.'s theory of the reactions involved in the electrolytic production of Al, the electrolysis occurs in two main steps: (1) an electrochemical action involving the separation of Na metal at the cathode and F at the anode and (2) a chemical reaction of Na with AlF_3, forming Al metal and regenerating cryolite. The AlF_3 present is presumed to be formed by the pyrolysis of the molten cryolite and is regenerated continuously at the anode by the action of F on the Al_2O_4 ions.

Dolomite brick for metallurgical purposes. M. DOUGLAS. *Iron & Steel Ind.*, **12**, 291 (1939); *Chem. Abs.*, **33**, 5142 (1939).—A criticism of Searle's paper (*Ceram. Abs.*, **20** [6] 145 (1941)) is presented. No variation in the behavior of brick from true dolomite or magnesian limestone was discerned. A stabilized refractory dolomite brick has been available for two years and is used by most steelworks in Great Britain. The successful separation of CaO from dolomite is reported. The product is dead-burned MgO used for magnesite brick or for fettling open-hearth furnaces.

***Effect of the refractory building material on the life span of reverberatory furnaces.** EDMUND R. THEWS. *Tonind.-Ztg.*, **65** [47] 452–54; [48] 464–66 (1941).—The life span of a reverberatory furnace is determined not only by the condition existing when it is in operation but also by the refractory brick, the mortar, and the laying of the brick. T. discusses problems such as the chemical and physical nature of the brick and mortar, the design of the brick, structural features, the design and construction of the furnace floor, stack, and arches, etc. The breaking-in of a new furnace is as important as the selection of proper building material, good design, and construction. All of these problems are analyzed and discussed. M.Ho.

Evaluation of properties of high-temperature insulating materials: III, Comparison of methods of determining bulk density of insulating brick. L. R. BARRETT, W. F. FORD, AND A. T. GREEN. *Bull. Brit. Refrac. Research Assn.*, No. 63, p. 28 (1942); reprinted in *Rept. Refrac. Materials Joint Comm., 33d Rept., Gas Research Board Commun.*, No. 7, pp. 36–47 (Sept., 1942).—Investigation of the various methods, (1) measuring a weighted prism with calipers, (2) using Archimedes' principle with water as the immersion liquid, and (3) using a mercury volumeter, showed that the first is liable to the least inherent

* Obtained from microfilm.

error and gives values which are reproducible to 0.5%. **IV, Thermal-shock tests for insulating brick.** *Bull. Brit. Refrac. Research Assn.*, No. 63, p. 38 (1942); reprinted in *Rept. Refrac. Materials Joint Comm., 33d Rept., Gas Research Board Commun.*, No. 7, pp. 47–59 (Sept., 1942).—Comparative trials were made of three methods of testing spalling resistance: (1) the "small prism," (2) the "miniature panel," and (3) the full-sized panel tests. All tests placed the brick in the same order provided no preheating was carried out. Preheating for long periods reduced the resistance to thermal shock, especially if the preheating was on one face only, as in the preheating of a panel. It is recommended that 24 hours' preheating should precede the panel spalling test at a temperature such that about 1.5% shrinkage occurs. In any test, as many brick as possible should be used. For Parts I and II see *Ceram. Abs.*, **21** [1] 14–15 (1942); **23** [4] 72 (1944). P.S.D.

Fire clays of Saarland. HANS BODE. *Feuerungstechnik*, **27**, 141–44 (1939); *Chem. Abs.*, **33**, 7507 (1939).

***Heat conductivity of magnesite brick.** HANS LASCH. *Tonind.-Ztg.*, **65** [44] 421–23; [45] 433–34 (1941).—The thermal conductivity of ten kinds of magnesite brick (of German make) was investigated at 400° to 800°. The determinations were made using a stationary heat flow, and measurements were direct. The apparatus consisted of an electrically heated oven built of the brick to be tested. The brick were heated on one side only. The flow of heat through the brick was determined with a Lamort heat-flow meter and Pt-Pt Rh thermoelements. The apparatus is described and illustrated. The results confirmed the belief that the thermal conductivity of magnesite decreases with increasing temperature. The conductivity of different kinds of magnesite brick varied widely up to approximately 700°. Beyond this temperature the spread narrows down. This tendency could be observed even below 700°. The conductivity of nine of the ten tested brick was 2.3 at 800°. The results generally are in good agreement with those of Wilkes (*Jour. Amer. Ceram. Soc.*, **16** [3] 125–30 (1933)). Below 700° there seems to be no relation between the conductivity and the volume weight of the brick. Above this temperature there are indications of an existing relation between these two, i.e., a decrease of the volume weight seems to result in a decrease of thermal conductivity at the same temperature. M.Ho.

Heat losses and most economical thickness for chamber-oven walls. P. BECKER. *Arch. Wärmewirt.*, **20**, 206–207 (1939); *Chem. Abs.*, **34**, 4309 (1940).—An equation is developed for calculating, with sufficient practical accuracy, the most economical wall thickness.

Influence of chemical activation of refractories on the combustion of firedamp. M. B. RAVICH AND B. A. ZAKHAROV. *Compt. Rend. Acad. Sci. U. R. S. S.*, **26**, 65–68 (1940) (in English); *Chem. Abs.*, **34**, 6424 (1940).—Reaction rates were studied with stoichiometric mixtures of H and O in packed and unpacked quartz tubes at 400, 700, 850, 900, and 950° and an initial pressure of approximately 1 mm. Hg. The rate of reaction is increased at low temperatures by the presence of commercial grog with surface coatings of Ni and Fe oxides and by Ural dunite. The activated grog and dunite yielded rates at 400° comparable to the rate obtained with the unactivated refractory at 950°. High-temperature annealing had little effect on the activities of these two refractories.

Innovations in the field of ceramics: I, Refractory insulating brick. W. FUNK. *Kolloid-Z.*, **93**, 127–28 (1940); *Chem. Abs.*, **35**, 1197 (1941).—A review of patents.

Magnesia sources and the magnesium-metal problem. J. T. SINGEWALD, JR. *Pit & Quarry*, **35** [2] 45–48, 50 (1942).—S. gives a statistical and economic analysis of the magnesium and dolomite industry. He discusses magnesia in refractories and magnesia from dolomite and describes the electrolytic processes and the carbothermic and ferrosilicon methods of producing magnesium metal. M.R.

Monolithic furnace linings: I, Experimental study of some unfired mixtures of refractory grog and clay. H. M. RICHARDSON, F. H. CLEWS, AND A. T. GREEN. *Bull. Brit. Refrac. Research Assn.*, No. 63, p. 77 (1942); reprinted in *Rept. Refrac. Materials Joint Comm., 33d Rept., Gas Research Board Commun.*, No. 7, pp. 75–85 (Sept., 1942).—The properties of unfired mixtures containing either calcined kyanite, calcined fire clay, or calcined china clay as grog and different proportions of fire clay or ball clay as bond were examined. As linings may be prepared by different methods using mixtures of widely varying consistency, test pieces were made by dry pressing with a water content of about 7%, by plastic molding with a water content of about 16%, and by slop molding with a water content of about 27%. Data were obtained on drying and firing contraction, bulk density, porosity, refractoriness under load, and behavior in the flame-impingement and slag tests. The results indicate the importance of low drying and firing contraction. Low drying contraction is obtained by molding mixtures with low water content at high pressure. A number of mixtures gave results in the tests comparable with those of normal fire-clay brick. P.S.D.

Refractories from the user's viewpoint. BERNARD THOMAS. *Claycraft*, **17** [5] 241–53 (1944).—T. discusses the various points to be considered in selecting refractories: (1) Temperature considerations. Most bar- or billet-heating furnaces have a temperature at the arch too great for the normal standard grade firebrick and require a brick of the siliceous grade. Open-hearth furnaces use a silica brick of 95 to 96% SiO_2. In a large furnace where only one or two shifts per day are worked or where the furnace may be shut down at a week-end, the silica brick is subject to spalling and a siliceous brick slightly below 90% SiO_2 will give better results. For oil or gas-fired furnaces, where the intensity of temperature at the arch is high, lower grades of aluminous-type brick containing 41 to 44% Al_2O_3 are employed. Silicon carbide brick and green chrome brick have high refractoriness but offer some disadvantage in weight and higher cost. (2) Spalling. Reasonable care should be employed to heat furnaces slowly from the cold. Handmade or wire-cut brick are often superior to machine-pressed brick in spalling resistance. (3) Hearths. In most cases a shaped bottom is used to avoid awkward angles and corners into which fuel or clinker may build up into a dead mass. Before the war a ramming mixture of magnesite was used, but at present a substitute of dolomite clinker is widely used which is found to be superior to magnesite. (4) General construction. The user should study (*a*) the hearth conditions of his combustion chamber, (*b*) the question of temperature, and (*c*) whether the heating of the steel takes place directly in the combustion or in a separate chamber. (5) Shape. (6) Jointing. The thinnest joint is the most satisfactory, and the bonding clay should, if possible, be the same as that from which the brick were manufactured. (7) Jointing or patching cements. (8) Heat-treatment furnaces. (9) Insulating materials. (10) Salvage. G.A.K.

Refractory firebacks for coke fires: II, Thermal stresses in flat brick. L. R. BARRETT AND A. T. GREEN. *Bull. Brit. Refrac. Research Assn.*, No. 63, p. 49 (1942); reprinted in *Rept. Refrac. Materials Joint Comm., 33d Rept., Gas Research Board Commun.*, No. 7, pp. 85–98 (Sept., 1942).—Previous work on temperature gradients occurring in a coke fireback dealt only with measurements of temperature at the hot and cold faces. The present work extends these measurements of temperature through the thickness of the fireback. Additional information thus obtained permits the graphical computation of stresses set up in the bottom brick during the life of the coke fire. The maximum stresses occur when the fire is "pulling through" and when the fire is dying out, being compressive and tensile, respectively, on these occasions at both the hot and cold faces. For Part I see *Ceram. Abs.*, **21** [10] 215 (1942). P.S.D.

Refractory insulating materials: VII, Properties of dry-pressed, grogged-clay insulating brick. L. R. BARRETT, J. F. CLEMENTS, AND A. T. GREEN. *Bull. Brit. Refrac. Research Assn.*, No. 63, p. 5 (1942); reprinted in *Rept. Refrac. Materials Joint Comm., 33d Rept., Gas Research Board Commun.*, No. 7, pp. 13–30 (Sept., 1942).—Brick were dry pressed from batches containing varying pro-

* Obtained from microfilm.

portions and grades of porous grog, prepared by firing a mixture of fire clay and pulverized coal. The bond was of similar composition. The grog and brick were fired in gas-fired kilns to 1290°, 1350°, or 1400°C. It was concluded that 1350°C. is about the most suitable temperature for the particular fire clay used. At this temperature the brick were of good shape, showed excellent resistance to spalling, and were of suitable bulk density and cold crushing strength. The thermal conductivity compared favorably with that of commercial brick. The shrinkage on reheating and refractoriness under load were such that a maximum safe temperature of use of about 1250°C. was indicated. Brick fired at 1290°C. were too weak for use except for backing-up purposes but had a thermal conductivity of less than 2 B.t.u./sq. ft./hr. °F./in. thickness at 500°C. mean temperature. Brick fired at 1400°C. contained cracks and were somewhat warped. The brick had a spalling resistance as good as those fired at 1350°C. but a rather high heat conductivity and capacity. In the majority of the experimental brick, porous grog finer than 60-mesh was excluded. When the fine grog was present the bulk density was increased 3 lb. per cu. ft., and the crushing strength was somewhat reduced. The maximum temperature of safe use was placed 20° to 25°C. lower than it was when no minus 60-mesh grog was used. **VIII, Behavior of refractory insulating brick coated with aluminous grog-clay mixtures.** L. R. BARRETT, W. F. FORD, AND A. T. GREEN. *Bull. Brit. Refrac. Research Assn.*, No. 63, p. 22 (1942); reprinted in *Rept. Refrac. Materials Joint Comm., 33d Rept., Gas Research Board Commun.*, No. 7, pp. 30–36 (Sept., 1942).—Previous work on small-sized test pieces indicated that tests on full-sized brick were required. Accordingly, tests of this kind were carried out, using refractory grogs consisting of calcined fire clay, calcined kyanite, or calcined china clay with 10 or 20% ball clay as bond. Generally satisfactory mixtures resulted from all three types of grog. Spalling tests showed that the china clay grog and calcined-kyanite coatings increased the spalling resistance of the brick 2 to 5 times. Calcination of the china clay grog to 1550°C. and upward eliminated cracking during slag attack, thereby producing a resistance to mill scale at 1350°C. only slightly inferior to that shown by calcined kyanite. The fire clay grog coating, although the poorest of the three with respect to its resistance to attack by mill scale, was only slightly inferior when subjected to the action of coal ash at 1400°C. For Parts **IV–VI** see *Ceram. Abs.*, **21** [10] 215 (1942).

P.S.D.

Refractory mortars for furnaces. REINHART. *Tonind.-Ztg.*, **63** [54] 617–19 (1939); abstracted in *Brit. Clayworker*, **48** [571] 257 (1939).—R. recommends definite mixtures for mortars to be used in laying silica brick and basic brick. As binders, he suggests water glass, high-alumina cement, colemanite, fine chalk, sulfite of lye, and clay. R.A.H.

Research and refractory materials, 1941. F. H. CLEWS, A. E. DODD, AND A. T. GREEN. *Bull. Brit. Refrac. Research Assn.*, No. 62, p. 1 (1942); abstracted in *Rept. Refrac. Materials Joint Comm., 33d Rept., Gas Research Board Commun.*, No. 7, pp. 98–99 (Sept., 1942). P.S.D.

Ukrainian kaolins as raw material for the aluminum industry. P. P. BUDNIKOV AND A. N. SYSOEV. *Vestnik Inzhenerov & Tekh.*, **1940**, No. 5, pp. 310–11; *Chem. Abs.*, **34**, 7547 (1940).—The practical value of the sulfite method for preparing Al_2O_3 from Ukrainian kaolins is described. The kaolin is fired at 800° to 900° and treated with SO_2 at 50° to 60° and 7 atm. At 80° to 100°, most of the Al sulfite (containing 29% Al_2O_3) precipitates out from the solution. The precipitate is ignited, and the SO_2 is recovered. The Al_2O_3 is then purified by the Bayer method. In another case the kaolin is fired and then treated with 25% HNO_3 in an autoclave at 150°, and the $Al(NO_3)_3$ is crystallized. The latter is decomposed by heating to 400° to 500°, or the $Al(NO_3)_3$ solution is neutralized with NH_3. In the first modification the HNO_3 is recovered, while in the second NH_4NO_3 is obtained. The use of HNO_3, however, involves corrosion problems.

***Use of chamotte brick for reverberatory furnaces.** EDMUND R. THEWS. *Tonind.-Ztg.*, **65** [61] 593–95 (1941).—A considerable number of ordinary and special refractories are available for metallurgical purposes; besides chamotte, quartz, magnesite, etc., there are the special refractories such as bauxite, sillimanite, ZrO_2, chromite, silicon carbide, etc. These materials, as well as the products made from them, vary widely in their reaction (basic, neutral, or acid), refractoriness, resistance to temperature changes, resistance to chemical corrosion, mechanical strength, etc., and in their relative ease of handling in building, cutting, shaping, etc. Some of the seemingly inherent characteristics can be modified to a large extent, e.g., by controlling the porosity, glazing, by using special mortars, etc. In spite of the available choice of refractories and the possibilities of modifying their properties, there are constant complaints of the failure of refractories. This failure of refractories in actual use can be attributed to one or more of the following causes: (1) failure to choose a refractory of the right composition for the given task, (2) selection of a refractory of inferior quality for the sake of economy, (3) faulty pretreatment of the refractory, e.g., improper storing, etc., (4) faulty treatment of the refractory during construction, (5) faulty construction, (6) unnecessary armor-plating of the brick, (7) excessive loading of the brick by superstructures, (8) faulty breaking-in of a new furnace, (9) faulty operation of the furnace, e.g., unnecessary sharp temperature changes, overheating of an empty furnace, metals in the furnace, careless handling of tools, etc., (10) faulty process. These points are discussed in detail. From his analysis, T. concludes that with proper care a good grade of chamotte brick is highly satisfactory for use in furnaces smelting white- and red-metal alloys. This brick combines good technological properties with a good resistance to the rather rough handling commonly encountered in these operations. In ideal conditions of operation, which extend to careful heating up and cooling down of the furnace, good magnesite brick equals the best of chamotte. True, their handling (laying, cutting, fitting, etc.) is harder than the handling of chamotte, but these difficulties are overcome easily by a good mason. This difficulty could hardly be decisive in choosing between chamotte and magnesite brick. For the average furnace of 15 to 20-ton capacity, the difference may amount to 2 to 3 days more in building the furnace.

M.Ho.

PATENTS

Production of magnesium hydroxide. OCEAN SALTS (PRODUCTS) LTD., AND R. F. HANSTOCK. Brit. 559,298, Feb. 23, 1944 (May 9, 1942).

Terra Cotta

***Decorating wall openings with building ceramics.** FRIED. IMHOLZ. *Tonind.-Ztg.*, **65** [62] 607–609 (1941).—Any discontinuity in a wall, e.g., windows, doors, etc., can be utilized for decorative purposes. The utilization of ceramic products for this purpose is discussed. M.Ho.

SEPARATE PUBLICATION

Special Salt-Glazed Pipes with Chemically Resistant Properties. British Standard Specification No. 1143—1943. British Standards Inst., London, 1944. Price 2s.—This specification applies to salt-glazed pipes (including drainpipe) used in chemical works and for drains in which pipes conforming to B.S.S. No. 65 are not suitable. The dimensions of pipes of various shapes are stated with permissible deviations. The tests required are as follows: (1) Absorption of water: During boiling, absorption shall be 2% with pipes up to 6 in. in diameter, rising to 8% with 21-in. and larger pipes. (2) Acid resistance: Broken pieces of the pipe, free from glaze, shall be crushed to pass a British Standard 18-mesh screen and be retained on a

* Obtained from microfilm.

25-mesh screen; 25 gm. of this (dried) material shall be heated in a porcelain dish with a mixture of 25 gm. concentrated sulfuric acid (density 1.84), 10 gm. concentrated nitric acid (density 1.42), and 65 gm. distilled water until it fumes strongly. When it is cool, 10 ml. of concentrated nitric acid diluted to 100 ml. with distilled water shall be added, and the mixture again heated to fuming. When cool, the sample is washed until free from acid and any precipitated silica and dried to constant weight not to exceed 1.5%. Details of joint thicknesses and of the space between the end of the spigot of one pipe and the bottom of the socket of the other for pipes of various sizes are stated. A.B.S.

Whiteware

Casting characteristics of clays: I, Improved methods for determination. R. Russell, Jr., and W. C. Mohr. *Jour. Amer. Ceram. Soc.*, **27** [4] 97–113 (1944).—24 references, 25 figures.

Effect of hardness of hammers on resistance of vitrified chinaware to chipping and to impact. R. F. Geller and A. S. Creamer. *Bull. Amer. Ceram. Soc.*, **23** [4] 146–49 (1944).—2 figures.

Platinum and ceramic apparatus in the chemical laboratory. Eugen Ryschkewitsch. *Chem.-Ztg.*, **64**, 285–87 (1940); *Chem. Abs.*, **35**, 2038 (1941).—Sintered alumina can be substituted for Pt apparatus in many cases. It is impermeable to liquids and gases and is weight-stable on heating. It is not affected by boiling acids, including HF. It is unstable toward alkali bisulfates. Numerous uses for alumina apparatus are given.

Rapid method of laboratory control of the composition of glaze in the porcelain and whiteware industry. L. M. Pavlenko. *Keramika*, **1939**, No. 9, pp. 9–11; *Chem. Abs.*, **34**, 4874 (1940).—Control is effected by determining by back titration the percentage of $CaCO_3$ in the batch, i.e., the amount of HCl used for the decomposition of $CaCO_3$ in the glaze multiplied by 5. Allowance must be made for the insoluble residue.

PATENTS

Steatite type ceramic material. Standard Telephones & Cables, Ltd. Brit. 559,462, March 1, 1944 (April 3, 1941).

Vacuum-tight high-temperature annular connection between a metallic and ceramic body. Akt.-Ges. Brown, Boveri & Cie. Brit. 559,429, March 1, 1944 (Aug. 15, 1941).

Water closet. W. E. Sloan (Sloan Valve Co.). U. S. 2,344,649, March 21, 1944 (Feb. 20, 1942); continuation of application Serial No. 241,791, Nov. 22, 1938.

Equipment and Apparatus

Aids to particle counting in the split-ultramicroscope. O. Spengler and H. Hirschmüller. *Kolloid-Z.*, **94**, 29–30 (1941); *Chem. Abs.*, **35**, 3127 (1941).—Special carbons for better light, improved photographic equipment, and a method for taking periodic photographs in determining the concentration of colloidal particles (in sugar juice) are described.

Air compressors: II, Aftercoolers. C. W. Gibbs. *Pit & Quarry*, **36** [6] 70–72 (1943).—G. discusses atmospheric moisture and its effect on compressed-air systems. The action of the aftercooler in removing this entrained moisture is described. 5 diagrams. **III, Lubrication and maintenance.** *Ibid.*, **36** [8] 75–78 (1944).—G. discusses the lubrication and maintenance of air compressors, giving general suggestions for obtaining uninterrupted service: (1) follow the manufacturer's instructions, (2) make someone responsible, (3) be sure he is informed, (4) use only the best oil but limit the supply, and (5) maintain a routine for inspections, cleaning, and maintenance. 4 photographs, 2 diagrams. For Part I see *Ceram. Abs.*, **23** [1] 28 (1944). M.R.

Ball, rod, and tube mills. J. W. Wardell. *Mine & Quarry Eng.*, **5**, 255–59, 313–16 (1940); *Chem. Abs.*, **35**, 664 (1941).—Power requirements and the relative utility of each type of grinding mill are considered.

Design of large-size laboratory extraction glass apparatus. Raymond Jonnard. *Ind. Eng. Chem., Anal. Ed.*, **16** [1] 61 (1944).—Illustrated. F.G.H.

Drying of green brick molded with the use of steam. I. M. Trubitsyn and S. V. Kanunnikov. *Keramika*, **1939**, No. 10, pp. 25–29; *Chem. Abs.*, **34**, 4873 (1940).—The use of steam to heat and moisten clay in the clay cutter, instead of cold water, considerably shortens the time of drying and improves the quality.

Handling materials. Anon. *Nat. Safety News*, **49** [3] 81–84, 86, 88, 91–93 (1944).—The selection, use, and care of fiber and wire ropes, hoisting chains, and rings and hooks are discussed. Grades of rope, safe loads for rope, and types of chains are covered, and miscellaneous lifting equipment such as chain hoists, power trucks, etc., are mentioned briefly. 2 photographs, 2 diagrams. M.R.

***Heat and operational problems of artificial drying.** Carl Schmidt. *Tonind.-Ztg.*, **65** [48] 461–64; [50] 487–90 (1941).—S. explains the principles involved in drying with steam, in vacuo, and with heated air. The use of psychrometric charts is explained. Chamber and tunnel driers are compared. As the tunnel drier can be effectively insulated, it is a great deal more economical. S. discusses the utilization of waste heat from plant equipment for drying brick. Plants producing hollow brick have enough waste heat to satisfy the demand for heat by the drying unit. In such cases the use of a more efficient and therefore usually more expensive drying unit is not justified, since there would be an excess of heat and no use for it. The choice of a chamber or a tunnel drier is no longer a question of which is more efficient; it is rather a part of the entire setup of the plant. It must further be emphasized that to be economical a tunnel drier must operate continuously, i.e., 24 hr. a day including week ends. This in itself creates problems which must be fitted into the scheme of the plant to avoid waste. M.Ho.

***Heat sources for drying brick.** R. Clauss. *Tonind.-Ztg.*, **65** [60] 584–86 (1941).—Various sources of heat, viz., waste steam from plant machines, flue gases from steam boiler and annular furnaces, heat from furnace and boiler rooms, heat recovered by cooling brick, and direct heat, are discussed from the standpoint of their utilization for drying brick. M.Ho.

Immersion heaters. Application to industrial processes. R. W. J. Cockram. *Elec. Rev.*, **134** [3457] 263–64 (1944).—C. discusses the application of immersion heaters for industrial purposes and gives suggestions pertaining to their design and employment. 2 diagrams. M.R.

Installation and maintenance of electric motors. J. L. Watts. *Mech. Handling & Conveying*, **31** [3] 117–22 (1944).—W. points out that most motor failures are due to (1) faulty workmanship or design in the motor itself, (2) incorrect installation or use, (3) negligence and poor maintenance, and (4) accidents. He then describes some installation faults and suggests precautions which should be taken to ensure long service. 3 diagrams. M.R.

Luminescent analysis in the plant laboratory and shop. E. M. Brumberg and Z. M. Sverdlov. *Izvest. Akad. Nauk S. S. S. R., Ser. Fiz.*, **4**, 75–82 (1940); *Chem. Abs.*, **35**, 1271 (1941).—Apparatus was constructed (a spark fluorophosphoroscope) which permits rapid determination of the type of glass. The same apparatus can be used for the luminescent analysis of porcelain, blast-furnace slags,

* Obtained from microfilm.

cements, and various minerals. For emeries, a special luminescence microscope was constructed with quartz lenses; corundum, diaspore, zircon, and mica can be determined in emery in 7 to 10 min.

***Mixers in the brick industry in the light of patent literature: III and IV.** ANON. *Tonind.-Ztg.*, **65** [43] 415–16 (1941); **V.** *Ibid.*, [44] 424–25.—A patent review dealing with mixers, kneaders, pug mills, grinding pans, and other clay-treating mills. M.Ho.

PATENTS

Abrading apparatus. D. C. TURNBULL (American Foundry Equipment Co.). U. S. 2,344,475, March 14, 1944 (Dec. 31, 1941).—Blast cleaning apparatus including a blasting station, a work-supporting carrier, means for transporting the carrier along a predetermined path.

Abrading apparatus. D. C. TURNBULL (American Foundry Equipment Co.). U. S. 2,344,476, March 14, 1944 (Dec. 31, 1941). W. L. KEEFER (Pangborn Corp.). U. S. 2,344,989, March 28, 1944 (Aug. 24, 1942).

Apparatus for extrusion of plastic material in tubular form. S. B. AVERY (Ruberoid Co.). U. S. 2,344,959, March 28, 1944 (Aug. 26, 1941).

Apparatus for measuring surface roughness. R. E. REASON AND R. I. GARROD (Kapella, Ltd.). U. S. 2,344,217, March 14, 1944 (Feb. 13, 1941).

Forming ceramic bodies. G. R. SHEPHERD (Westinghouse Electric International Co.). Brit. 559,618, March 8, 1944 (June 12, 1942).

Instruments for determining the roughness of surfaces. D. BROWN & SONS (Huddersfield), LTD., AND W. A. TUPLIN. Brit. 559,622 and 559,623, March 8, 1944 (Aug. 21, 1942).

Mixing apparatus especially adapted for mixing pulverized materials. J. E NAUTA (vested in the Alien Property Custodian). U. S. 2,345,063, March 28, 1944 (Oct. 31, 1940).

Kilns, Furnaces, Fuels, and Combustion

***Annular or tunnel kilns in the brick industry?** W. NEIMANN. *Tonind.-Ztg.*, **65** [35] 336–38 (1941).—N. briefly reviews the modern development of the annular and the tunnel kiln. Although the latter is older, its use was not widespread because of the increased cost of production when a tunnel kiln is used. Recent improvements have considerably reduced the cost of production of brick fired in a tunnel kiln. The two types of kilns are discussed and analyzed. N. concludes that an output of about 5,000,000 brick per year in a tunnel kiln is definitely possible. The cost of production in the case of either of the kilns varies with conditions and should be analyzed in each case. The great advantages offered by a tunnel kiln compel its consideration in newly built plants. It is to be hoped that as a result of cooperation between the builder and the industry, the tunnel kiln will find widespread adaptation in the brick industry. M.Ho.

***Annular or tunnel kiln in the brick industry?** W. AVENHAUS. *Tonind.-Ztg.*, **65** [46] 441–45 (1941).—A. discusses the two kinds of kilns and their use for firing brick. Their cost of operation, capacity, ease of operation, and suitability for firing various shapes and forms are discussed. M.Ho.

***Firing brick and clinker.** OTTO KRAUSE AND HSUN SHAN CHEN. *Tonind.-Ztg.*, **65** [65] 653–55; [66] 679–81 (1941).—The main factors of ceramic firing are temperature, duration, and kiln atmosphere. The effects of these factors are expressed in the structure changes, sintering process, and properties of the fired product (brick, clinker, etc.). These effects were investigated on widely differing brick and clinker clays. The clays were freed of interfering impurities, notably CaO. Particular attention was paid to the Fe_2O_3 content. This was changed stepwise, and its effect on promoting sintering was studied. The experiments ran along two main lines: (1) keeping a constant composition of the combustion-gas (2% of CO) isotherm and varying the period of firing (19, 60, 190, 600, and 1900 min.); and (2) keeping the firing time constant (190 min.) and varying the atmosphere in the furnace (strongly oxidizing, neutral, and strongly reducing). The setup and apparatus are described in detail. A report of the results is to follow. See *Ceram. Abs.*, **22** [10] 180 (1943). M.Ho.

Firing china glost. Growing interest in electrical methods. ANON. *Elec. Rev.*, **134** [3455] 182–84 (1944).—A continuous tunnel kiln constructed by G. W. B. Electric Furnaces, Ltd., for George Jones and Sons, Ltd., Crescent Works, Stoke-on-Trent, England, is described. The kiln is 75 ft. long and accommodates 17 trucks, each bearing 18.5 to 25 dozen pieces of ware, depending on the size of the pieces. To conserve heat and control temperature, a Gibbons Controvec system is incorporated in the kiln. A maximum temperature of 1150°C. may be reached, and the average electrical consumption is 63.6 kw.-hr. 5 photographs. M.R.

Gas radiant-tube heating speeds war production. J. L. WHITTEN. *Amer. Gas Assn. Monthly*, **26** [2] 67–70, 94–95 (1944).—W. discusses the application of alloy radiant-tube heating to bell-type annealing furnaces. The tubes and their action are described in detail. 10 photographs. M.R.

New horizons for industrial gas. C. CONE. *Amer. Gas Assn. Monthly*, **26** [4] 155–59, 182–84 (1944).—Fuel-gas technology has been applied to many new fields, including ferrous and nonferrous metallurgy. The availability of gas-fired radiant-tube elements and controlled-atmosphere furnaces has facilitated heat-treatment processes and made possible faster bright annealing, clean hardening, and other techniques. "Gas pickling" has improved the wearability of zinc coatings, and the process may have interesting applications to other products in the near future. Other fuel-gas applications are in the early stages of laboratory investigation. 7 diagrams, 6 photographs. M.R.

Overhead radiant heating. K. G. ECCLESHARE. *Gas Jour.*, **231**, 26, 29 (1940); *Gas World*, **113**, 34–35; *Chem. Abs.*, **34**, 6492 (1940).—Heaters are described, and information is given on some installations and costs of operation.

Radiant-gas heat serves world's largest airships. F. K. WHITESIDE. *Amer. Gas Assn. Monthly*, **26** [3] 132–34 (1944).—The Pan American World Airways, at La Guardia Field, New York, N. Y., has in its new shops a large gas-fired salt-bath aluminum heat-treating furnace. It can handle sheets up to 14 ft. long and 4 ft. wide and is of the most modern type. Burners selected for the furnace were the all-ceramic Duradiant burners. The furnace and burners are described. 4 photographs. M.R.

Russians gasify coal underground. ANON. *Heating & Ventilating*, **41** [3] 78 (1944).—Two methods of underground gasification of coal are being used in Russia: (1) the "stream" method, which is particularly applicable to sharply inclined seams, and (2) the "warehouse" method, which involves preliminary underground mining, in which chambers in the coal bed are filled with crushed coal. A variation of the "stream" method, known as the "regenerative" method, is proposed. Gas produced has a fairly low thermal value. M.R.

Use of the discriminant function in the comparison of proximate coal analyses. W. D. BATEN AND C. C. DEWITT. *Ind. Eng. Chem., Anal. Ed.*, **16** [1] 32–34 (1944).—Comparing a number of analyses of a material from one source with analyses of similar material from another source has heretofore presented a very real problem. This paper applies statistical methods to the comparison of proximate analyses and B.t.u. per pound of coal from two mines. Statistical analysis by random sampling shows the probability that the two coals come from the same

* Obtained from microfilm.

source. The discriminant function developed by Fisher is used. By means of this function a comparison may be obtained between analytical data based on material from one source and data on similar material from a different source. In addition, the order of significance of the several analytical constituents in a single series of samples may be determined. The method is capable of general application.
F.G.H.

Geology

Aluminum ore (preliminary report)—alunite (a supplement). YAHEI ASADA. *Bull. Inst. Phys. Chem. Research* [Tokyo], **19,** 43–44 (1940); *Chem. Abs.*, **34,** 5019 (1940).—The amount of the ore deposits in China is estimated at about 260,197,000 tons of pure alunite. See *Ceram. Abs.*, **18** [4] 110 (1939).

Bauxite as a drying adsorbent. W. A. LA LANDE, JR., W. S. W. MCCARTER, AND J. B. SANBORN. *Ind. Eng. Chem.*, **36** [2] 99–109 (1944).—The activation of trihydrate bauxites at temperatures up to 1600°F. has been studied with particular reference to the production of a highly efficient drying adsorbent. Data show the relationship between activation temperature, residual volatile matter content, surface area, dry gas capacity, and equilibrium capacity. The mechanism of the thermal decomposition of bauxite is discussed with reference to the results of differential thermal and X-ray diffraction analyses. The maximum dry gas capacity is attained by activation at 700° to 750°F. This treatment reduces the volatile matter content of the mineral from about 28–30 to 6–8%. Under optimum activating and operating conditions, bauxite will adsorb 11 to 16% by weight of water before any moisture is detectable in the effluent. Activated bauxite may be regenerated repeatedly by heating at 300° to 500° F. The various other factors which influence drying efficiency are discussed. Illustrated. F.G.H.

Bentonite in Canada. H. S. SPENCE. *Clay Products News*, **17** [3] 13 (1944).—The more important known deposits in the Prairie Provinces are exposed mainly in areas dissected by drainage channels, where they show as beds in the slopes bordering valleys and in the sides or on top of small buttes in typical badland topography. Several occurrences have been mined on a small scale. Markets are for foundry sand and bleaching clay. Minor industrial uses are as follows: emulsifying agents; in soaps and detergents; in cosmetic and pharmaceutical preparations; as a suspending agent in horticultural sprays; as a plasticizer in ceramic bodies, slips and glazes, and plasters; to improve the flow and workability of concrete; in cement manufacture; and in the clarifying of wines and vinegar.
G.A.K.

Bureau of Mines seeking to make U. S. independent of foreign alumina ores. R. S. DEAN. *Pit & Quarry*, **35** [11] 63–64 (1943).—D. gives an authoritative explanation of the Bureau's program for utilizing domestic raw materials for the production of aluminum with a statement of accomplishments. M.R.

Coating of paper. B. W. ROWLAND. *Paper Trade Jour.*, **112** [26] 75–77 (1941).—Factors affecting the coating of paper, such as raw stock, clay, and starch, are discussed. The type or blend of clays is considered very important, as it controls the colloidal properties of the coating. Hydration behavior, base-exchange capacity, and particle size are important clay properties to be considered. W.R.B.

Constitution of refractory earths of the territories of Civitacastellana, Fiano Romano, and Roccastrada (Rome Province). VITTORIO CIRILLI AND ANTONIO GIANNONE. *Ricerca Sci.*, **11,** 978–84 (1940); *Chem. Abs.*, **35,** 3781 (1941).—Thermic, dilatometric, and roentgenographic examinations of these refractory materials are reported. They contain kaolinite and halloysite, together with various quantities of alunite or hydrargillite.

Formation of a layer of terra sigillata or Lemnian earth. A. J. RIJKEN AND J. C. L. FAVEJEE. *Chem. Weekblad*, **38,** 262–64 (1941); abstracted in *Chem. Zentr.*, **1941, II** [26] 3231.—To obtain a product with properties similar to those of terra sigillata, a study of the fineness of the clay materials was found inadequate; therefore the mineralogical composition of the clay particles was further varied. It was found that neither a clay with kaolinite predominating nor one composed principally of montmorillonite produced a material similar to terra sigillata, but a clay having a fineness $<2\ \mu$ and 90% muscovite did so. A slip of this clay made with little water was applied to an unfired body and then fired to 1000°. Both the brilliance and the color corresponded to those of terra sigillata.
M.V.C.

Mineralogical composition of clays and their physical and chemical properties. I. D. SEDLETSKIĬ AND S. YUSUPOVA. *Compt. Rend. Acad. Sci. U. R. S. S.*, **26,** 244–46 (1940) (in English); *Chem. Abs.*, **34,** 5792 (1940).—An account is given of a detailed investigation of various specimens of Middle-Asiatic clays and loesses. The mineralogical composition was determined separately in the fractions 2 to 0.2 μ and $<0.2\ \mu$ by the thermal and X-ray methods. After preparation of the clays by international method A and subsequent dispersion with NaOH, the fractions were segregated by a centrifuge. The adsorption was determined according to the universal method of Gedroitz. The data point to the existence of a definite relation between the physical and chemical properties of clays on one hand and the composition of the respective minerals on the other. The physical properties are not necessarily connected with the available quantity of colloids. The chemical composition depends directly on the composition of their respective minerals. Fersman's contention that the paragenesis of elements depends on the paragenesis of minerals was fully confirmed. Ca and Mg are in the main connected with montmorillonite and Ca and Na with micas, while Mg is also connected with saponite. Variations in the content of these elements as well as the ratio $SiO_2:Al_2O_3$ are explained by the differences in the quantity of available minerals and their proportion in the mixture. 4 references.

New maps of Georgia kaolin. ANON. *Mfrs. Record*, **113** [3] 68 (1944).—Geologic maps of Twiggs, Washington, and Wilkinson Counties, Ga., are available from the Director, Geologic Survey, Washington 25, D. C. The three maps cover most of the cretaceous sedimentary kaolin district of Georgia in which reserves of kaolin are considered to be very large. M.R.

Output of bauxite more than double previous record. ANON. *Pit & Quarry*, **36** [9] 66 (1944).—U. S. output in 1943 was estimated at 7,026,040 short tons (dried bauxite equivalent) compared with 2,966,221 tons in 1942, while mine shipments were estimated at 6,752,250 tons in 1943 compared with 2,768,343 tons in 1942. Total imports in 1943 were probably at an all-time high but are expected to be less in 1944. M.R.

Physical and colloidal chemistry of clays. C. G. ALBERT. *Jour. Amer. Leather Chemists Assn.*, **35,** 25–36 (1940); *Chem. Abs.*, **34,** 2548 (1940).—The surface activity of kaolin particles is discussed. Particle-size data are given for some commercial kaolins. Penetration of kaolin into sheep leather is illustrated by photomicrographs. See *Ceram. Abs.*, **19** [2] 52 (1940).

Purification of quartz sand from Ceylon for glassmaking purposes. ANON. *Bull. Imperial Inst.*, **38,** 356–59 (1940); *Chem. Abs.*, **35,** 863 (1941).—The product as received was a badly graded sand, unsuitable in its natural state for the manufacture of medium-quality glassware because of irregular grain size and high Fe content (0.36% Fe_2O_3), present mainly as ilmenite. Screening through two sieves of appropriate size gave a middle fraction consisting of more than 50% of the original sand and with much lower (0.08%) Fe_2O_3 content; this fraction would be suitable for the manufacture of medium-quality glassware. Electro-

magnetic treatment of this fraction yielded a sand of great purity (0.01% Fe_2O_3) suitable for the manufacture of special glasses of high quality.

Quantitative mineralogical analysis applicable to nepheline-syenites and other nephelite-bearing rocks. M. DORFMAN. *Compt. Rend. Acad. Sci. U. R. S. S.*, **26,** 453–55 (1940) (in English); *Chem. Abs.*, **34,** 5790 (1940).—The following method was developed for calculating the quantitative mineralogical composition of nephelite-bearing rocks; one of the surfaces of the specimen is ground and immersed in a 5% HNO_3 solution which dissolves nephelite; after 5 to 7 hours' exposure the specimen is washed, brushed, the SiO_2 gel being removed, and dried. Light-colored feldspar and dark-colored minerals appear on the surface. It is then immersed (surface up) in a solution of aluminon (1 gm. : 10 liters H_2O), slightly acidulated with AcOH. A red varnish is formed on the nephelite surface. Calculations of the mineralogical composition of rocks are made by means of a special millimeter plate by the point method at 1-mm. intervals. The only drawback of this method is that it does not permit distinguishing other minerals of the sodalite and cancrinite group.

Reagents for the flotation of apatite-nephelite ores. M. A. BRYUĬER AND R. Z. ERENBURG. *Zhur. Khim. Prom.*, **16** [12] 38–43 (1939); *Chem. Abs.*, **34,** 7147 (1940).—The naphthene soap obtained by alkaline extraction of the kerosene fraction of oil, when used in diluted alkaline solution, gives more foam than peat tar or the liquid soap prepared from naphthenes, rosin, and fish oil, but in all other respects it is a superior reagent for apatite flotation.

Silicification. VOLKMAR WROOST. *Abh. Senckenberg*, No. 432, pp. 1-68 (1936); *Neues Jahrb. Mineral., Geol.*, Ref. I, **1939,** 84; *Chem. Abs.*, **33,** 3726 (1939).—The formation of flint is referred to organic SiO_2 resulting from the desilicification of sponge spicules. The reason for their accumulating in one stratum of chalk and not in another is discussed at length; it is considered to depend on the varying relative amounts of CO_2, CaO, and colloidal SiO_2 present at the particular spot, while chalcedony, where present, attracts the SiO_2 in solution.

Supermicroscopic investigation of the structure of bentonites. V. MIDDEL, R. REICHMANN, AND G. A. KAUSCHE. *Wiss. Veröffentl. Siemens-Werken, Werkstoff-Sonderheft*, **1940,** 334–41; *Chem. Abs.*, **35,** 4167 (1941).—With 15,000 to 40,000× enlargement it is seen that only the American Na bentonites are suitable for strong films. European Ca bentonites, mostly transformed into alkali bentonites by alkali salts, are insufficient.

Supplying bauxite and leucite to the aluminum and aluminum-alloy industries. GEORGE KIMPFLIN. *Génie Civil*, **116,** 344–45 (1940); *Chem. Abs.*, **34,** 7799 (1940).—Germany's supplies of bauxite are increased by importations from Yugoslavia, Hungary, and Rumania. Italy relies upon her leucite deposits which are now being exploited on a large scale.

Western Hemisphere's only big tin smelter in Texas. ANON. *Mfrs. Record*, **113** [3] 44, 56 (1944).—The tin smelter at Texas City, Texas, was erected to refine Bolivian tin. The project is the only one of its kind in the Western Hemisphere. After Pearl Harbor the plant capacity was increased to equal that formerly available to all the United Nations. M.R.

Zeolites of the Crimea. M. N. SHKABARA. *Compt. Rend. Acad. Sci. U. R. S. S.*, **26,** 659–61 (1940) (in English); *Chem. Abs.*, **34,** 5792 (1940).—On the basis of the material collected, the following sequence of formation of minerals was established. First phase: prehnite I, quartz I, heulandite I, delessite I, gmelinite I, wellsite I, analcite I; 2nd phase: prehnite II, heulandite II, gmelinite II, calcite I, quartz II; 3rd phase: wellsite II, phillipsite, analcite II, leonhardite, calcite II; 4th phase: delessite, Fe hydrates, and Ca sulfates. Crystallographic data and data on thomsonite and phacolite are also given. 3 references.

SEPARATE PUBLICATION

High-Purity Dolomite in Illinois. H. B. WILLMAN. *Illinois State Geol. Survey, Rept. Investigations*, No. 90, 87 pp. (1943).—Illinois contains extensive deposits of pure dolomite which is suitable for refractories for open-hearth furnaces, flux for blast furnaces, and the manufacture of magnesium. In the Chicago region east of Joliet and north of Kankakee are many undeveloped deposits of high-purity dolomite in the Niagara formations. Some of the purest deposits are ancient coral reefs. The data available from outcrops suggest that certain deposits in the vicinity of Kankakee comprise several hundred acres of dolomite more than 100 ft. thick and shallow enough to be quarried. Deposits occur near Sag Bridge, Chicago Heights, Stony Island, Romeo, Hinsdale, New Lenox, Manhattan, La Grange Park, Naperville, Frankfort, Lockport, and Lemont. The Savanna-Port Byron region contains numerous undeveloped deposits of high-purity dolomite. Deposits which appear to have commercial possibilities occur near Savanna, Mt. Carroll, Lanark, Fulton, Albany, Morrison, Garden Plain, Fenton, Cordova, Port Byron, and Hillsdale. Although high-purity dolomite is widely distributed in the Rockford region, it is usually less pure than that found in the other regions. Typical exposures occur near Rockford, Belvidere, Oregon, Dixon, Freeport, Mt. Carroll, Elizabeth, and Galena. The Grafton-Hardin region in Jersey and Calhoun Counties, northwest of Alton, contains high-purity dolomite which is part of the Silurian formations. The principal exposures are near Grafton, where the high-purity dolomite, generally about 25 ft. thick, has a thick overburden except in small areas along the Mississippi bluffs. G.A.K.

Chemistry and Physics

Analysis of the Raman and infrared spectra of α-quartz. BISHAMBAR DAYAL SAKSENA. *Proc. Indian Acad. Sci.*, **12A,** 93–139 (1940); *Chem. Abs.*, **35,** 30 (1941).—Quartz has 16 fundamental vibration frequencies: 4 at 207, 356, 466, and 1082 $cm.^{-1}$, Raman-active and infrared-inactive; 4 at 364, 508, 777, and 1149, Raman-inactive and infrared-active only in the extraordinary ray; and 8 doubly degenerate, active in both Raman and infrared only in the ordinary ray, at 128, 265, 479, 695, 1063, 1159, and the doublets at 392 to 403 and 795 to 807. The weak lines at 452, 503, and 1228 are combinations appearing in the degenerate class. The assignments of these fundamental frequencies to symmetry modes have been confirmed by the observed behavior of the lines in infrared absorption and light scattering. When quartz is heated near the α-β transformation temperature, the 207 line broadens and shifts, which indicates its relation with this mode of vibration to change the symmetry of quartz from trigonal to hexagonal. The specific heat between 23° and 808° abs., calculated on the basis of the analysis, agrees well with experimental results.

Cataphoresis of purified fractionated kaolinite particles. W. L. COUGHANOUR AND J. L. UTTER. *Jour. Amer. Ceram. Soc.*, **27** [4] 116–20 (1944).—14 references, 3 figures.

Chemistry of titanium: XVII, Effect of calcination on the properties of titanium dioxide. A. V. PAMFILOV, E. G. IVANCHEVA, AND K. F. TREKHLETOV. *Zhur. Priklad. Khim.*, **13,** 1310–14 (1940); *Chem. Abs.*, **35,** 2432 (1941).—The appearance of a yellow color in TiO_2 on calcining was due to the presence of Fe oxides and had no connection with the transition of the anatase structure into the rutile structure. Sufficiently pure samples remained white or became slightly grayish in this transition. The optimal temperature of calcining products separated from sulfate solutions was somewhat higher than 800°. The product

of rutile structure was a better pigment than that of anatase structure; it had a better covering power and required less oil.

Constitution of colloidal silica. P. C. CARMAN. *Trans. Faraday Soc.*, **36**, 964–73 (1940); *Chem. Abs.*, **35**, 678 (1941).—Applying the following assumptions, the distinctive properties of silica sol, silica gel, and Na silicate solutions may be simply correlated: (1) The surface Si ions tend to complete the characteristic Si–O tetrahedra and produce a strongly adsorbed single layer of water molecules, yielding surface OH groups which have a weak tendency to dissociate to give H ion. (2) Hydration of silica is purely a surface phenomenon, and the transition to $Si(OH)_4$ is continuous. (3) Instability of hydrated silica explains the constant tendency to undergo irreversible condensation leading to larger units. (4) In alkaline media there is strong tendency to destroy –Si–O–Si– links, leading to smaller particles.

Determination of silicic acid in bauxites by fusion with thiosulfate and sulfur. V. M. KOPELIOVICH. *Zavodskaya Lab.*, **10**, 37–38 (1941); *Chem. Abs.*, **35**, 5063 (1941).—Mix 0.5 gm. of the finely ground sample in a porcelain crucible with 10 to 12 gm. of a mixture of equal volumes of $Na_2S_2O_3$ and S or with S alone. Cover the crucible, place for 3 to 5 min. at the edge of a muffle furnace to expel moisture, and heat until flames cease to emerge from under the crucible cover. Transfer the warm crucible to a porcelain cup containing 25 to 30 ml. of H_2SO_4 (1:1), cover with a watch glass, and carefully add 15 ml. HNO_3 (1.40) after the reaction has subsided. Heat gradually, evaporate to fumes of H_2SO_4, fume for 5 to 10 min., remove from the hot plate, and allow to cool. Add carefully 150 to 200 ml. water and 10 to 15 ml. HCl (1.19); heat to dissolve the salts. Remove from the hot plate, allow the precipitate to settle, filter, wash ignite, and weigh. The procedure requires 3 to 3.5 hr.

Dichromate determination of iron, using the silver reductor. J. L. HENRY AND R. W. GELBACH. *Ind. Eng. Chem., Anal. Ed.*, **16** [1] 49 (1944).—Potassium dichromate, using diphenylamine sulfonic acid as indicator, is an oxidizing agent for the determination of iron by the Walden silver reductor method. Manganese, chromium, and titanium do not interfere. Vanadium does not interfere in concentrations of 100 mg. or less in 200 ml. of titrating solution. A more economical method results from the use of only 1 *N* hydrochloric acid instead of the higher concentrations of sulfuric acid required in the ceric sulfate method. The stability, purity, low equivalent weight, and comparatively low cost of potassium dichromate make it a desirable oxidizing agent in this connection. F.G.H.

Floc-forming chemicals. L. B. MILLER. *Paper Trade Jour.*, **112** [8] 142–49 (1941).—M. discusses the application of floc formation in the paper industry. Many of the soluble metallic compounds form precipitates with alkalis and are therefore used in water treatment. Titanium compounds have recently come into use. Other factors, such as concentration, pH, temperature, etc., are discussed. W.R.B.

Fused salt technique in spectrochemical analysis. N. H. NACHTRIEB, D. H. JOHNSON, AND K. S. DRESS. *Ind. Eng. Chem., Anal. Ed.*, **15** [12] 734–36 (1943).—A technique is described for the analysis of powders which may be dissolved in molten potassium acid sulfate. The method has been applied to the determination of antimony, vanadium, chromium, and iron in titanium dioxide, analysis conditions and working curves for which are presented. The advantages derived from the application of background corrections are illustrated by working curves for a vanadium line. The fused-salt technique of preparing samples and standards may be extended to many other substances which are difficult to dissolve in the common solvents or to arc as such. The selection of a flux in a particular case will be determined largely by solubility considerations and by its suitability as a spectroscopic buffer. Illustrated. F.G.H.

General theory of thixotropy and viscosity. C. F. GOODEVE. *Trans. Faraday Soc.*, **35**, 342–58 (1939); *Chem. Abs.*, **33**, 3232 (1939).—Thixotropy, the isothermal reversible decrease of viscosity with increase of rate of shear, is assumed to arise from the presence of a scaffolding structure in colloidal solutions. This network of particles aggregated in the form of chains and cross chains is used to explain non-Newtonian viscosity. The latter, considered to consist of two parts, one Newtonian and the other thixotropic, arises when there is interference between the particles and the formation of these links. When stretched and broken, they give rise to a transfer of momentum from a moving layer to a neighboring layer. The magnitude of the momentum transfer is inversely proportional to the rate of shear, and the rate of transfer is proportional to the rate of shear. The total force due to these links is the product and is therefore independent of the rate of shear, a behavior found with thixotropic substances. Some applications of this theory are presented.

Gravimetric determination of tungsten with anti-1,5-di-(*p*-methoxyphenyl)-1-hydroxylamino-3-oximino-4-pentene. JOHN H. YOE AND A. LETCHER JONES. *Ind. Eng. Chem., Anal. Ed.*, **16** [1] 45–48 (1944).—A new organic compound has been developed as a reagent for the gravimetric determination of tungsten. Its physical and chemical properties have been investigated, and procedures are given for its use in the determination of tungsten in ores and alloys. Determinations of tungsten with the new reagent are equivalent in accuracy to the standard cinchonine method. F.G.H.

Investigation of the lines of the Kβ group of silicon in some of its compounds. YA. M. FOGEL. *Zhur. Eksptl. Teoret. Fiz.*, **9**, 1217–25 (1939); *Chem. Abs.*, **35**, 27 (1941).—Experimental data on the fluorescence spectra of Si, SiO_2, SiC, and Na_2SiF_6 and the primary spectra of Si and SiC are given. The line $K\beta_1$ appears in the compounds of Si but not in elementary Si. F. contends that the appearance of the $K\beta_1$ line in the primary spectrum of the element is due to its oxidation to SiO_2 on the anticathode. SiC does not give this line under the same conditions. The $K\beta_x$ spectra of the conductors Si and SiC are wide and thus differ from the narrow $K\beta_x$ lines of the nonconductors SiO_2 and Na_2SiF_6. From the influence of the temperature on the width of the $K\beta_x$ line of a given substance, F. determines the nature of its conductivity. From the width of the $K\beta_x$ lines of elementary Si and the distribution of intensity in them, it follows that, although Si shows metallic conductivity, the Sommerfeld theory of free electrons does not describe the electronic states of the conducting electrons in Si. On strong heating, the width of the $K\beta_x$ line of Si varied only from 12.4 to 14.0 X units while that of SiC broadened from 12.7 to 28.4 X units.

Polarographic analysis of dilute solutions of bismuth. DONALD F. SWINEHART, A. B. GARRETT, AND WILLIAM M. MACNEVIN. *Ind. Eng. Chem., Anal. Ed.*, **15** [12] 729–31 (1943).—Data are presented for the quantitative polarographic analysis of dilute solutions of bismuth in the form of the complex tartrate in acetate-buffered solutions. Such solutions (10^{-5} to 3×10^{-3} molal) can be analyzed with an average error of 1 mg. of bismuth per liter. The diffusion current is not quite a linear function of the bismuth concentration from 1×10^{-5} to 3×10^{-3} molar solutions at the pH value and tartrate concentration investigated in this work. The half-wave potential is a function of the pH of the solution. Illustrated. F.G.H.

Potentiometric measurements of hydrogen-ion concentration in solutions of low dielectric constant. A. GEMANT. *Jour. Chem. Phys.*, **12** [3] 79–88 (1944).—G. discusses the potentiometric measurements of hydrogen-ion concentration in solutions of *p*-toluene sulfonic acid and picric acid in xylene and dioxane. Parallel conductivity measurements complete the data. Apart from the usual concentration cells, another type of cell has been tried, viz., one in which the two solutions have not only different concentrations but different dielectric constants. The principal findings are as follows: (1) Glass electrodes react reversibly with hydrogen ions in organic solvents of dielectric constant as low as 2.3. (2) Acids in such solvents behave essentially as weak electrolytes. (3) Deviations from the simple mass action law are explainable, to a cer-

tain extent, on the basis of varying dielectric constant with varying electrolyte concentration. (4) Hydrogen transference numbers and approximate values for absolute ionic radii can be computed from combined conductivity and e.m.f. data. G.A.K.

Precise measurement of volume in titrimetric analysis. WILLIAM M. THORNTON, JR. *Ind. Eng. Chem., Anal. Ed.*, **16** [1] 50–53 (1944).—A review of the precise measurement of volume in titrimetric analysis is presented. Detailed descriptions of the burettes and special techniques used by T. are given. Representative standardizations indicate the reliability to be expected under the prescribed conditions. Illustrated. F.G.H.

Principles of thermodynamics. B. LEAF. *Jour. Chem. Phys.*, **12** [3] 89–98 (1944).—A formulation of thermodynamics has been developed which points out the restrictions of classical treatments. This formulation in terms of potential and charge concepts predicts the property ascribed to the entropy of increasing during thermodynamic processes and leads to an equation for entropy produced and heat dissipated in irreversible processes. The postulates of the treatment presented have allowed deduction of a generalized form of the second law of thermodynamics which applies to each energy field of the system. These concepts have been further developed in discussion of the phase rule; the functions H, A, and F; a generalization of Kelvin's postulate; and a generalization of the Carnot cycle. The results obtained have permitted derivation of the principle of Brønsted's system of energetics. G.A.K.

Quantitative determination of crystalline materials by X-ray diffraction. S. T. GROSS AND D. E. MARTIN. *Ind. Eng. Chem., Anal. Ed.*, **16** [2] 95–98 (1944).—A method is described for using X-ray diffraction patterns for the chemical analysis of crystalline compounds. The line intensities, which are recorded by a suitable microphotometer, are corrected by means of a simple graphical correction based upon an internal standard to an arbitrary basis used for all comparisons. The accuracy of the method is limited by the microphotometer, grain size of the film, exposure relations, possibility of solid solution, etc., and will ordinarily be within 5% of the observed value. Mixtures of materials are readily analyzed from a single pattern after standard patterns are taken to determine the characteristic constants. Data are given for several compounds. The method is independent of absorption corrections, sample shape effects, wave-length radiation used, etc. Illustrated. F.G.H.

Rapid volumetric method for the estimation of iron and titanium and its application to ilmenite analysis. P. R. SUBBARAMAN AND K. R. KRISHNASWAMI. *Proc. Indian Acad. Sci.*, **11A**, 106–15 (1940); *Chem. Abs.*, **34**, 4011 (1940).—Fuse the sample with $KHSO_4$. Extract the melt with dilute H_2SO_4. In an aliquot part of the solution determine Fe and Ti together by reducing in a Jones reductor and titrating with $KMnO_4$. In another aliquot, titrate the reduced solution with standard Fe^{III} solution to get the Ti^{III}.

Reactions in the solid state at higher temperatures: XXV, Intermediate states occurring in the formation of nickel aluminate from nickel oxide and aluminum oxide in the solid state. WILHELM JANDER AND KARL GROB. *Z. Anorg. & Allgem. Chem.*, **245**, 67–84 (1940); *Chem. Abs.*, **35**, 5051 (1941).—Mixtures of NiO and α-Al_2O_3 in a 1:1 mol. ratio were heated at various temperatures between 500° and 1100°. Roentgenographic study of the preparations showed no detectable compound formation below approximately 1000°; at this temperature crystals of a spinel became apparent, and at 1100° the lines of the original components had practically disappeared. See "Research . . .," *Ceram. Abs.*, **19** [1] 32 (1940); "Reactions . . .," *ibid.*, [5] 124.

Recent discovery of commercial titanium ore. C. C. COULTER. *Mining Jour.* [Phoenix], **23** [9] 7 (1939); *Chem. Abs.*, **34**, 1281 (1940).—Large quantities of Ti ore of satisfactory commercial grade were discovered in Hidalgo County, N. Mex., near the Arizona border. It is a replacement deposit of contact metamorphic origin. The content of TiO_2 increases with depth. The deposit is approximately 70 ft. wide and 1000 ft. long.

Resolution of the tiniest discrete particles, with particular reference to molecules, with the universal electron microscope. MANFRED VON ARDENNE. *Z. Physik. Chem.*, **A187**, 1–12 (1940); *Chem. Abs.*, **35**, 1685 (1941).—The present resolving power of approximately 30 a.u. makes possible the estimation of molecular weights from particle sizes if the molecular weights are above approximately 3×10^6. The existence of particles with diameters of $1/2$ to $1/3$ the resolving power can be detected, provided they are metallic, i.e., high density in nature; owing to the lower contrast between particle and background, organic substances can be detected only if their particle diameters are approximately 40 a.u. The necessary conditions for securing maximum contrast are discussed; for an accelerating potential of 60 kv., the aperture ratio (twice the most probable scattering angle) of the objective must not be greater than 7×10^{-3}. From the diameter (220 a.u.) and density (1.5) of spherical hemocyanin molecules, the molecular weight is calculated to be 4×10^6. Edestin has a particle diameter of 80 a.u. and a molecular weight of 3.1×10^5 at a concentration of 10^{-8} gm. per cc. H_2O. Glycogen (10^{-6} gm. per cc. H_2O) has a particle diameter of 80 a.u. and a molecular weight of 3×10^5. By developing methods for surrounding organic molecules with metallic particles, much smaller molecules could be detected. Electron photomicrographs of Au sols, Wyoming bentonite, hemocyanin, edestin, and glycogen are included. See "Investigation . . .," *Ceram. Abs.*, **20** [6] 154 (1941).

PATENTS

Obtaining soluble beryllium compounds starting from ores containing beryllium. CARLO ADAMOLI (Perosa Corp.). U. S. 2,344,480, March 14, 1944 (Feb. 10, 1941).

Producing calcium boride. A. L. FOX. U. S. 2,344,859, March 21, 1944 (Feb. 7, 1941).—The method of producing calcium boride which comprises passing a current between two electrodes in a molten bath consisting essentially of lime, boric oxide, and calcium chloride in the ratio of 1, 0.5 to 1.5, and 10, respectively, and then removing the cathode from the bath and scraping the cathode product from the cathode before it has cooled sufficiently to harden.

Removal of zinc from lead. W. T. MENSON (American Metal Co.). U. S. 2,344,629, March 21, 1944 (Feb. 11, 1942).

Sodium aluminate product and process of producing. F. K. LINDSAY AND B. F. WILLEY (National Aluminate Corp.). U. S. 2,345,134, March 28, 1944 (Nov. 27, 1939).

General

*Accident prevention in the clay industry. ANON. *Tonind.-Ztg.*, **65** [34] 328–29 (1941). M.Ho.

John Alexander Campbell. ANON. *Bull. Amer. Ceram. Soc.*, **23** [4] 127–29 (1944).—1 photo.

*Draining clay pits. ANON. *Tonind.-Ztg.*, **65** [33] 315–17; [34] 326–27 (1941).—The problem of draining is more acute in the spring when the pits start operating and it becomes necessary to drain the water accumulated during the winter. A number of stationary and movable pumps suitable for draining clay pits are described. M.Ho.

Dust can be drafted. A. C. STERN. *Safety Eng.*, **87** [2] 10–12 (1944).—S. discusses exhaust systems for the removal of dust from industrial plants, particularly exhaust hoods, which are separated into three classes, viz., canopy, lateral, and downdraft. 2 photographs. M.R.

Dusty jobs. J. M. KANE. *Safety Eng.*, **87** [3] 25–26, 28 (1944).—K. discusses the control of dust-producing operations which, in most cases, involves (1) the applica-

* Obtained from microfilm.

tion of exhaust ventilation and (2) confining and entraining dust at the point of generation by an exhaust system. The latter's effectiveness depends upon the design of hoods and enclosures. Several types are described. 4 photographs. M.R.

Further observations on the possible systemic toxicity of certain of the chlorinated hydrocarbons with suggestions for permissible concentrations in the air of workrooms. CECIL K. DRINKER. *Jour. Ind. Hyg. & Toxicol.*, **21**, 155–59 (1939); *Chem. Abs.*, **34**, 543 (1940).—A high-Ca diet has no protective effect against liver lesions. Administration of xanthine does not prevent liver injury. High urinary chlorides follow the feeding of hexachloronaphthalene to dogs. The permissible limits of these compounds in the air of workrooms is 0.5 to 10.0 mg. per cu. m.

Hand tools. ANON. *Nat. Safety News*, **49** [3] 140, 142 (1944).—About 7% of all industrial injuries and 11% of the compensation payments involve the use of hand tools. The use of good handles, soft nonferrous hammers, and nonsparking tools is discussed in detail. 1 photograph. M.R.

Modern arc furnace. T. J. ESS. *Iron & Steel Engr.*, **21** [2] AF7–58 (1944).—E. summarizes construction and operating practices, including shells, linings, charging methods, electrodes, transformers, switchgear and bus structure, arc control, furnace arrangement, materials, process, melting, oxidation and deoxidation periods, tapping and pouring, alloy additions and recovery, bath temperature, slag, thermal requirements, power input, power consumption, and production. B.L.

Occupational therapy. HELEN S. WILLARD. *Bull. Amer. Ceram. Soc.*, **23** [4] 153–54 (1944).

Presidential address, 1944. CECIL E. BALES. *Bull. Amer. Ceram. Soc.*, **23** [4] 129–30 (1944).

Purification of water with bentonite. H. L. OLIN AND H. F. FREEMAN. *Paper Trade Jour.*, **113** [19] 38–42 (1941).—Bentonite coagulates to form flocs that serve to remove suspended impurities in water when it is dispersed as negatively charged particles in waters containing electrolytes. Its coagulative effect is slight in the presence of monovalent cations and fairly rapid in hard waters containing divalent calcium and/or magnesium, but it can be accelerated by the addition of trivalent aluminum or iron. The results of experiments using bentonite alone, bentonite with lime softening in split treatments, bentonite and alum (both straight and split), and bentonite and alum with lime softening are described. W.R.B.

Purifying water for the pulp and paper industry. A. F. MCCONNELL. *Paper Trade Jour.*, **112** [26] 89–93 (1941).—Constituents of water undesirable for use as process water in the pulp and paper industry are given. M. describes means to remove or reduce impurities, including zeolites, Spaulding precipitator, and sand filters. W.R.B.

Selection of the right pipe for power piping systems. A. C. KIRKWOOD. *Heating, Piping & Air Conditioning*, **16** [3] 129–31 (1944).—K. discusses pipe selection for power piping systems in accordance with the American Standard Code for Pressure Piping. The general conditions surrounding selection of the desirable pipe material and the correct wall thickness are considered briefly. 4 charts. M.R.

Survey in seventeen cement plants of atmospheric dusts and their effects on the lungs of twenty-two hundred employees. LEROY U. GARDNER, THOMAS M. DURKAN, DANIEL M. BRUMFIEL, AND HOMER L. SAMPSON. *Jour. Ind. Hyg. & Toxicol.*, **21**, 279–318 (1939); *Chem. Abs.*, **34**, 867 (1940).—Few workmen in this industry are exposed to high-silica dusts. Although dust counts are frequently high, the incidence of lung infections is less than that in the general population. Of the workmen examined (2278), only 8 showed evidence of nodular fibrosis; in 6 of these, previous employment was presumably responsible.

Testing a.-c. motors. Trials under full-load conditions. K. BROOM. *Elec. Rev.*, **134** [3452] 85–86 (1944).—B. discusses a method of testing a.-c. motors under full-load conditions. The procedure for slip-ring and squirrel-cage motors is given in detail. 2 diagrams. M.R.

PATENT

Making roofing granules. S. G. WRIGHT. U. S. 2,344,073, March 14, 1944 (Sept. 22, 1941).—The method of forming a roofing granule which comprises partially firing natural clay in lumps to produce a temperature of at least 1200°F. in the clay, fracturing the partially fired lumps into granules of a suitable size for roofing, and completing the firing of the granules.

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THE BULLETIN SECTION

Volume 23 May 15, 1944 Number 5

ELIZABETH G. OVERBECK

THE OVERBECK POTTERY

Founded by Four Sisters

Established in 1911 in Cambridge City, Indiana, in an old house with a large yard, a workshop in the basement, a studio on the first floor, and a kiln in a small separate building at the back of the house: this is the widely known Overbeck Pottery.

Four sisters established the Pottery—Margaret, Hannah, Elizabeth, and Mary. Margaret Overbeck, who died the year the Pottery was started, was an art teacher at DePauw University, Greencastle, Indiana. She had studied art at the Cincinnati Art Academy and under Arthur W. Dow of Columbia University, had worked as a decorator in a pottery at Zanesville, Ohio, and had designed for a china painter's magazine, *Keramic Studio*, published in Syracuse, New York.

Hannah B. Overbeck, an invalid for many years, also did designing for *Keramic Studio*. For several years, she supplied numerous designs for decoration of the pottery. She died in 1931.

Mary F. Overbeck

Elizabeth G. Overbeck was housekeeper for her parents as long as they lived. After they died, she took a course in ceramics under Charles Fergus Binns at the New York State School of Clayworking and Ceramics, Alfred, New York. Up to the time of her death in 1936,* she had charge of the technical part of the work, such as working out glaze recipes and clay mixtures and doing the work on the wheel. She was a Fellow of The American Ceramic Society.

* See *Bull. Amer. Ceram. Soc.*, **16** [2] 67 (1937).

Mary F. Overbeck had been a public-school art teacher and had studied at the Indiana State Normal School, Terre Haute, Indiana, and under Arthur W. Dow of Columbia University. She also had done designing for *Keramic Studio*. Formerly in charge of the artistic part of the work, she is now, as the sole surviving member, carrying on the business on a much smaller scale.

The identifying mark of the Overbeck Pottery (see cut) is a combination of OBK from the name. On the vases that were made several years ago by Elizabeth and decorated by Mary or Hannah, the letter "E" placed below the mark and to the left means that Elizabeth made the vase; an "H" or an "F" at the right-hand side means that Hannah or Mary F. decorated it.

When the Pottery was established, the sisters intended to produce whatever an art pottery produced at that time, vases, bowls, and sets of different kinds. It was also necessary for them to make a part of their living by selling what was made. It was slow work, as the Pottery could afford little advertising. To eke out a small income from sales, pottery classes were started, sometimes in the basement workshop and sometimes in the city of Richmond, Indiana, sixteen miles away. The Pottery became known mostly by one person telling another person about it.

Elizabeth G. Overbeck at the wheel

Emphasis on Original Design and Handmade Pieces

The Pottery has emphasized original design and handmade products. A number of molds were made at one

Overbeck pottery in the collection of John D. Nixon, Centerville, Indiana

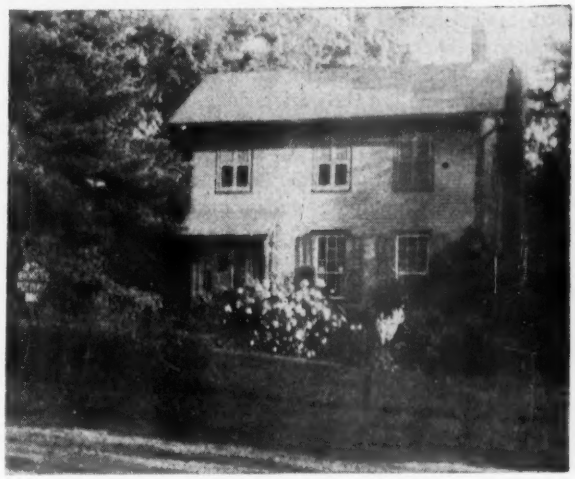
Part of Memorial Exhibition at the Cambridge City Public Library, May 16, 1937

time but are seldom used. Wheel-made and hand-built pieces have always been preferred.

The equipment in the Pottery consists of a Revelation portable kiln (burning coal oil and now only half the size of the original kiln), a potter's wheel, a one-jar ball mill for grinding glazes, and a spraying outfit. All of the equipment is run by one electric motor. There is a wedging block, a pair of scales, and not much else; some tools of different kinds, bats, and crocks of glaze.

At first the clay was weighed out, mixed, and lawned by hand. Now a white-firing earthenware clay is bought prepared in a dry state, soaked, and finished on the wedging block. Formerly some color was added to it, and a white soft porcelain was made for a time. Occasionally some of the red-firing native clay (from the orchard back of the house) was used.

The glazes used are those originated by Elizabeth. Mary has made a few changes in recent years. At first the glazes used were mat glazes in subdued colors, as other



Overbeck Pottery

Recent work of Overbeck Pottery

art potteries were using at that time. This practice has changed gradually until now bright glazes with more color are almost entirely used.

Present Character of Product

The character of the product also has changed. In the beginning, vases, bowls, tea sets, candlesticks, and tile were made. A number of years ago, the sisters began to make figurines of different sizes and now, in the last year or so, the output has consisted almost entirely of these little figures, four or five inches high, of ladies and gentlemen in old-fashioned costumes and grotesque and humorous figures of people, animals, and birds. Special figures and groups have been made; for instance, several groups showing the life of the Overbeck family: a man on a high bicycle, a man and girl on a tandem, a horse and buggy, a horse and buckboard, and a covered wagon with an ox team. Many special orders have been filled, such as a family group sitting around the fireplace on a floor made of tile to represent carpet and hearth. One woman asked for a figure of her mother sitting in a big chair sewing on a quilt block, the cat beside her and a hooked rug on the floor. A number of pet dogs have been reproduced, and old family photographs or tintypes have been used for special groups. Specially designed pottery brooches have been made in the last two years, some with figures of little ladies on them, others with birds: bluebirds, redbirds, robins, goldfinches, and owls.

The finished ware is kept on tables and shelves in the studio where most of the work is done. Some of the pieces were formerly put on sale in Indianapolis and Chicago and at the local public library. Of late years, all of the pottery has been sold at the studio, for the demand has been greater and, with only one person working, the output has been less. In the thirty-two years of its existence, the Pottery has become known over a large territory. Before the restrictions on gasoline, visitors came from all over the country. The group is now more local, but in the last months several have come from long distances.

Near Route 40

Cambridge City, a town of about two thousand persons, is situated on the old Cumberland National Road, now called Route 40, which is the main street of the town. The Pottery is one square south of this main street and across the end of the cross street. The family came to this house when the potters were little girls. It was built in 1838 shortly after the town was incorporated. Although it was remodeled when the Pottery was started, a large part of it remains as it was originally.

An ancestor in the mother's family was a potter (a great-grandfather). He worked first in Lehigh County, Pennsylvania, where his father and grandfather had been gunsmiths and all-around handy men, and then near Hamilton, Ohio. The father was nominally a farmer but preferred to make things with his hands. A few pieces of old furniture still in the home were made by him.

John D. Nixon, Centerville, Indiana (nine miles east of Cambridge City), has, with his collection of Indiana paintings and antiques, a complete collection of Overbeck pottery which contains examples of the pottery from the beginning up to the present time. He and Mrs. Nixon have been friends of the potters for many years.

At different times in its history, the Overbeck pottery has been exhibited in most parts of the country. For many years it has taken most of the first premiums at the Indiana State Fair, which, because of the war, has been discontinued temporarily. The ware has not been exhibited recently outside of the studio. A number of home economics and art clubs and school classes have been entertained at the studio with a demonstration of work on the wheel and other processes.

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PRESIDENT'S EDITORIAL

"DOUBLE THE MEMBERSHIP"

By E. H. Fritz

With this as a slogan, our Membership Committee is actively at work on a well-conceived and comprehensive program which has for its ultimate objective increasing our membership, both Individual and Corporation, to double its present size. It is not intended to accomplish this ambitious goal during the current year. That would be neither desirable nor wise, but it is expected that substantial progress will be made during the next twelve months.

The idea was conceived during Cecil Bales' administration, and the work that he did in cooperation with the Membership Committee indicates very definitely that some determined organized effort will bring results. Furthermore, the recent decision by the Board of Trustees to add an Associate Secretary to the staff means that our income must be increased to carry this additional expense. Membership dues are our main source of income, and this addition, which likely will become effective during the latter half of this year, necessitates a definite plan of action of this kind.

Our Society has shown a rather steady growth during the last twenty-five years and, at present, consists of 2147 Personal and 324 Corporation members. This is a sizable group, but compared to the size of the industry which it serves and to the number of individuals engaged in that industry who could derive benefit from The Society our membership is quite small. Even if we doubled it, we would by no means include all of those who should belong to The Society.

There is no doubt, therefore, that by proper approach and explanation of what The Society has to offer it should be comparatively easy to induce many of these potential members to join. The field is particularly fertile among production and operating men. The Society offers much to these men, and the plans that are under way for the coming year will increase its value to such men. These plans involve a definite schedule of programs and sessions for the presentation of papers and the holding of discussions and symposia on practical operating problems. This will not be done at the expense of technical papers, but rather it will mean a better balance between the two types of papers.

We can also very easily increase our Corporation memberships because the 324 Corporation members we now have are only a small part of the ceramic industry. Here again our plan to offer more to the operating men should appeal to corporations that are not now members. The Society serves every one of these corporations whether they are members or not, and if they can be made to realize this, the Corporation dues will be a small item. On the other hand, these additional memberships and dues will greatly increase and widen the service which The Society renders.

Other technical societies have greatly increased their membership during the last two decades. The American Chemical Society has more than doubled its membership during the last twenty years and now consists of 36,000 members. Our program, therefore, is not too ambitious and even our goal of 5000 members does not compare too favorably with the present membership of the American Chemical Society on the basis of the relative size of the industries served.

Our Membership Committee is a strong one, consisting of Ralston Russell, Jr., as Chairman, and the following individuals, each of whom represents one of the Divisions: W. A. Weldon, Design Division; J. F. Hunt, Enamel Division; F. V. Tooley, Glass Division; V. V. Kelsey, Materials and Equipment Division; L. C. Hewitt, Refractories Division; C. F. Tefft, Structural Clay Products Division; and A. A. Wells, White Wares Division. These men have been active in The Society, know its value, and are enthusiastically sold on the idea to Double the Membership. They are working and will continue to work on this membership program throughout the year. They, however, cannot do it alone. They must have the enthusiastic help and support of all of our members. If each member will become membership-conscious, it would be an easy task to Double the Membership because, actually, it would mean hardly anything more than each member bringing in a new one. Most all of us, by looking around and giving this a little thought, will find a prospective Individual or Corporation member close at hand. Go to work on him, tell him about what The Society has been doing and what more it expects to do, tell him that our recent Annual Meeting and the autumn meetings during the last year had the largest attendance we have ever had and about the opportunity which this presents of meeting and talking to many people about problems of common interest. I am sure an impressive story can be told, one that will accomplish the desired result. Won't you help in this important undertaking and have a part in building further our great Society and thereby widen and increase its usefulness and service to our ceramic industry and to mankind?

Stupakoff Ceramic & Manufacturing Company
Latrobe, Pennsylvania

FELLOWS OF THE AMERICAN CERAMIC SOCIETY ELECTED IN 1944

Oscar Gray Burch, General Research Laboratory, Owens-Illinois Glass Co., Toledo, Ohio.

George Eugene Crawford, Universal Sanitary Mfg. Co., Camden, N. J.

Robert Edwards Gould, Buffalo Pottery, Inc., Buffalo, N. Y.

Frederick Curtis Henderson, Royal China Co., Sebring, Ohio.

John Henry Isenhour, Isenhour Brick & Tile Co., Salisbury, N. C.

Harry Custer Plummer, Structural Clay Products Institute, Washington, D. C.

Max Y. Seaton, Westvaco Chlorine Products Corp. and United Chemicals, Inc., New York, N. Y.

Kenneth Eugene Smith, Newcomb College, Tulane University, New Orleans, La.

INSTITUTE OF CERAMIC ENGINEERS

Executive Committee, 1944–1945

President: M. F. BEECHER, Norton Co., Worcester, Mass.
Vice-President: T. A. KLINEFELTER, U. S. Bureau of Mines, Tuscaloosa, Ala.
Secretary: R. S. BRADLEY, A. P. Green Fire Brick Co., Mexico, Mo.
Past-President: H. B. DUBOIS, Consolidated Feldspar Corp., Trenton, N. J.
Trustee Representative: H. M. KRANER, Bethlehem Steel Co., Bethlehem, Pa.

NEW MEMBERS

The Membership and Examinations Committee, together with the Executive Committee of the Institute of Ceramic Engineers (1943–1944), announces the election of the following:

Junior Grade

FRANK C. ARRANCE, Spark Plug Div., Electric Auto-Lite Co., Fostoria, Ohio.
DAVID M. BAKER, Insulator Div., Ohio Brass Co., Barberton, Ohio.
GILBERT J. CAHOON, Knox Porcelain Corp., Knoxville, Tenn.
MERVIN A. FAY, Fuel Dept., Bethlehem Steel Co., Sparrows Point, Md.
WILLIAM J. HARR, Commercial Decal, Inc., Mt. Vernon, N. Y.
NEIL T. MORRISON, Isolantite, Inc., Belleville, N. J.
JOHN W. NELLEY, Edgar Thomson Works, Carnegie-Illinois Steel Corp., Braddock, Pa.
WILLARD D. PACKMAN, Stupakoff Ceramic & Mfg. Co., Latrobe, Pa.
JOHN F. QUIRK, A C Spark Plug Div., General Motors Corp., Flint, Mich.
JOHN J. REIMER, New York State College of Ceramics, Alfred, N. Y.
CHARLES V. RUE, Canadian Steatite Co., Ltd., Georgetown, Ont., Canada.
PAUL C. SHAFFER, Westinghouse Electric & Mfg. Co., Fairmont, W. Va.
FRANCIS P. SHONKWILER, Hays Laboratory, Harbison-Walker Refractories Co., Pittsburgh, Pa.
ARCHIE A. SHUKLE, A C Spark Plug Div., General Motors Corp., Flint, Mich.
JAMES A. THOMAS, JR., Research Dept., Carborundum Co., Niagara Falls, N. Y.
ALAN B. WILLIAMS, Babcock & Wilcox Co., Augusta, Ga.

Associate Grade

JOHN F. HEROLD, Tide Water Associated Oil Co., Ventura, Calif.
A. CURTIS JACKSON, The Claycraft Co., Columbus, Ohio.

PRIZE WINNERS FROM SIXTH ANNUAL EXHIBIT, CERAMIC CAMERA CLUB, PITTSBURGH, PA.

Classification	Award	Picture Title	Exhibitor
PICTORIAL	First Prize	"The Trail Blazers"	Robert W. Knauft, Charles Taylor Sons Co., Cincinnati, Ohio
	Honorable Mention	"Peace in Green Valley"	J. Earl Frazier, Frazier-Simplex, Inc., Washington, Pa.
PORTRAIT	First Prize	"La Señorita"	V. H. Remington, B. F. Drakenfeld & Co., Inc., Washington, Pa.
	Honorable Mention	"Hound Pup"	George A. Mays, California Pottery Co., Niles, Calif.
INDUSTRIAL AND SCIENTIFIC	First Prize	"Steatite Coil Cores"	Rolland Roup, Globe-Union, Inc., Milwaukee, Wis.
	Honorable Mention	"Sunbeams and I Beams"	H. M. Kraner, Bethlehem Steel Co., Bethlehem, Pa.
CHAUNCEY E. FRAZIER AWARD		"La Señorita"	V. H. Remington, B. F. Drakenfeld & Co., Inc., Washington, Pa.

APPRECIATION TO LOCAL COMMITTEE, FORTY-SIXTH ANNUAL MEETING

Dr. A. P. Thompson
Mellon Institute
Pittsburgh, Pa.

April 14, 1944

Dear Paul:

YOURS APRIL 11,
ANNUAL MEETING ACCOUNTING

Thanks very much for your detailed account of the Local Committee expenditures and receipts.

The Local Committee is to be complimented upon the total Committee expenditures of $1037.87 against the appropriation of $1200.

Compliments, also, to the Ladies' Committee, which operated a very satisfactory ladies' entertainment at a total cost to The Society of $95.91 against a budget of $100.

Each and every one of the Committees functioned very efficiently. The unanimous opinion of the attending members was that the Meeting, in all respects, was the best ever held by this Society. The technical programs were excellent, but it would have indeed been a dreary occasion without the very fine entertainment provided by the Local Committee.

Compliments, also, upon the amount of entertainment provided. It was just enough; none of it was too little or too late.

Appreciatively,
ROSS C. PURDY, *General Secretary*

NEW MEMBERS IN APRIL

Corporation

AMERICAN VALVE & ENAMELING CORP., Charles A. Wulf (voter), Box 114, Indianapolis 6, Ind.

ASHWORTH, GEORGE L., & BROTHERS, LTD., R. L. Evans (voter), Broad St. Works, Hanley, Stoke-on-Trent, England.

*BINKS MFG. CO., E. F. Watts (voter), 3114 Carroll Ave., Chicago, Ill.

*THE CLAYCRAFT CO., C. Forrest Tefft (voter), Box 866, Columbus 16, Ohio.

FOSTER-FORBES GLASS CO., F. R. Motsch (voter), Marion, Ind.

GLENSHAW GLASS CO., INC., George W. Meyer (voter), Glenshaw, Pa.

HEISEY, A. H., & CO., T. Clarence Heisey (voter), Newark, Ohio.

HIGMAN, JOHN W., CO., Robert J. Stone (voter), 24 State St., New York, N. Y.

IMPERIAL GLASS CORP., C. J. Uhrmann (voter), Bellaire, Ohio.

INDIANA GLASS CO., Charles L. Gaunt (voter), Dunkirk, Ind.

INDUSTRIAL FILTERSACK CO., Hugh Nile (voter), Wellsville, Ohio.

KERR, ALEXANDER H., & CO., INC., C. H. Hubbard (voter), Sand Springs, Okla.

KNOX GLASS ASSOCIATES, INC., R. R. Underwood (voter), Oil City, Pa.

KNOX GLASS BOTTLE CO., J. H. Levis (voter), Knox, Pa.

LAURENS GLASS WORKS, INC., E. D. Easterby (voter), Laurens, S. C.

*LIBERTY GLASS CO., George F. Collins, Jr. (voter), 317 East Lee, Sapulpa, Okla.

MARIENVILLE GLASS CO., Clarence R. Deible (voter), Marienville, Pa.

NORTHWESTERN GLASS CO., Edward S. Campbell (voter), 5801 E. Marginal Way, Seattle, Wash.

PENNSYLVANIA BOTTLE CO., William Gallagher (voter), Sheffield, Pa.

SAXONBURG POTTERIES, George H. Aderhold (voter), Saxonburg, Pa. (formerly in name of George H. Aderhold, personal member).

THATCHER MFG. CO., Roy S. Arrandale (voter), 1901 Grand Central Ave., Elmira, N. Y.

WOODVILLE LIME PRODUCTS CO., J. Robert Cowell, Jr. (voter), 2140 Jefferson Ave., Toledo, Ohio.

Personal

ALEXANDER, FRED, 725 Munroé St., New Castle, Pa.; Universal Sanitary Mfg. Co.

ANDERSON, THEODORE E., 724 Frick Bldg., Pittsburgh 19, Pa.; National Gypsum Co.

AUSTIN, JANET, 580 Washington Ave., West Haven, Conn.; Fuller Merriam Co.

BANKSON, JOHN P., 1800 Farmers Bank Bldg., Pittsburgh 22, Pa.; Harbison-Walker Refractories Co.

BECK, ROY D., Park Ave., W. Road, Mansfield, Ohio; Westinghouse Electric & Mfg. Co.

BLACKBURN, R. A., Robinson Ventilating Co., Zelienople, Pa. (membership formerly in name of R. R. Robinson).

BOVEE, BENEDICT A., 220 78th St., Niagara Falls, N. Y.; chief engineer, Globar Div., Carborundum Co.

BURY, THOMAS, 63 Higher Croft Rd., Lower Darwen, Lancashire, England.

CALA, CHARLES F., 144 Hoover Rd., Rochester, N. Y.; in charge of glassmaking, Bausch & Lomb Optical Co.

COFFER, L. WALLACE, 105 Center Ave., Burgettstown, Pa.; plant control chemist, Climax Molybdenum Co. of Pennsylvania.

*CONARD, JOHN B., 508 Woodward Ave., Mansfield, Ohio; Richland Shale Brick Co.

*CORNELIUS, Y. R., 6407 S. E. Morrison, Portland, Ore.; consulting engineer.

DAVIES, EDWARD G., Wallaceburg, Ontario, Canada; plant manager, Dominion Glass Co., Ltd.

DEPAOLIS, PAUL F., 150 Longacre Rd., Rochester 5, N. Y.; design and development engineer, Hawkeye Works, Eastman Kodak Co.

DING, YESUN, National Resources Commission, 40 Wall St., New York, N. Y.

DORSEY, BAIRD L., 6625½ Church Ave., Pittsburgh 2, Pa.; Jones & Laughlin Steel Co.

DOUGHERTY, W. E., 53 N. Emily St., Pittsburgh 5, Pa.; O. Hommel Co.

*DURBIN, EDMUND, 266 E. Torrence Rd., Columbus, Ohio; Ceramic Div., Battelle Memorial Institute.

ELLISON, HENRY W., 6 E. First St., Corning, N. Y.; Corning Glass Works.

*EMERSON, WALTER H., Forsythe Place, East Liverpool, Ohio.

*FISCHER, EUGENE H., Masonic Apt. 2A, Latrobe, Pa.; manufacturing engineer, Westinghouse Electric & Mfg. Co.

*FORD, GEORGE D., 2136 Wilmer St., Zanesville, Ohio; director of research, Mosaic Tile Co.

GALBREATH, WILLIAM W., JR., 142 Garden Rd., Norris, Tenn.; U. S. Bureau of Mines.

*GIESEY, V. A., 1704 W. Carson St., Pittsburgh, Pa.; Narco Products Co.

GUY, THOMAS J., 660 Hanna Bldg., Cleveland, Ohio; Robertson & Co., Inc.

*HANNAH, E. R., 620 E. Jackson St., Mexico, Mo.; A. P. Green Fire Brick Co.

HARPER, RODERICK L., Harper Electric Furnace Corp., Niagara Falls, N. Y.

*HENSON, W. H., 65 Whitman Rd., Worcester, Mass.; Norton Co.

HINES, RONALD W., 1221 Highland St., Columbus, Ohio; research engineer, Battelle Memorial Institute.

HOHMANN, FREDERICK R., 804 W. Nelson St., Marion, Ind.; glass technologist, Pittsburgh Plate Glass Co.

*JONES, RICHARD E., Research Lab., Pittsburgh Plate Glass Co., Creighton, Pa.

KING, W. F., 4715 North 13th St., Philadelphia 41, Pa.

KINGSBURY, HOWARD F., 5099 Vallamont Dr., Williamsport, Pa.; glass technologist, Sylvania Electric Products, Inc.

KNIGHT, EDMUND H., Box 150, Crooksville, Ohio; Maurice A. Knight Sons Co.

LANE, GEORGE J., 88 Linden Ave., Metuchen, N. J.; Edgar Brothers Co.

MARTIN, ROBERT F., 4125 Garrison St., N. W., Washington 16, D. C.; executive secretary, Vitrified China Assn.

MCCOMAS, CLARENCE B., T. C. Wheaton Co., Millville, N. J.

*OSTRANDER, VAN R., 111 Sumner Ave., Yonkers, N. Y.; Western Electric Co.

OTT, LAWRENCE H., Research Div., Rheem Mfg. Co., 1209 East 25th St., Baltimore 18, Md.; assistant director of research.

OUTCAULT, HARRY E., 250 Park Ave., New York 17, N. Y.; St. Joseph Lead Co.

PORST, EDWARD G., 51 E. Randall St., Baltimore, Md.; Pemco Corp.

REID, HARRY F., JR., 34 W. Tulane Rd., Columbus 2, Ohio; Battelle Memorial Institute.

REIK, RICHARD, 212 Carmel Ave., Piedmont, Calif.; patent attorney.

REISS, MAX S., 4709 Noble St., Bellaire, Ohio; Bellaire Enamel Co.

REUTER, MALVERN M., 1600 Alum Creek Dr., Columbus, Ohio; ceramic engineer, Ohio State Univ. Engineering Experiment Station.

*ROBERTSON, R. K., 906 University Tower Bldg., Montreal, Quebec, Canada; Laprairie Co.

ROBINSON, RADCLIFFE F., 377 S. Warren Ave., Columbus, Ohio; research engineer, Battelle Memorial Institute.

*ROYAL, HERBERT F., 8525 Butler Ave., Detroit, Mich.; Champion Spark Plug Co.

*RUST, VERNON N., 3601 Santa Fe Ave., Los Angeles, Calif.; superintendent, Glass Containers, Inc.

* Indicates former member of The Society rejoining.

SCHMIDT, BEUTHER L., Anchor Hocking Glass Corp., Lancaster, Ohio.
*SHARDLOW, L. RUSSEL, RCA Victor Div., Radio Corp. of America, Harrison, N. J.
SHOOK, THURSTON W., 845 Hanna Bldg., Cleveland, Ohio; Basic Refractories, Inc.
*SMITH, KENNETH M., Box 53, Pikesville 8, Md.; U. S. Bureau of Mines.
SPARROW, PAUL F., 610 Shady Dr., East, Pittsburgh 16, Pa.; Norton Co.
*STARK, RAWSON E., R. D. 5, Greensburg, Pa.; Stupakoff Ceramic & Mfg. Co., Latrobe, Pa.
STEWART, S. T., 1205 Carlisle St., Tarentum, Pa.; chemist, Pittsburgh Plate Glass Co., Creighton, Pa.
TOMPKINS, J. F., 5622 Chartres St., Houston 4, Texas; producer of ceramic raw materials.
*TRUBY, HARRY A., 604 Ridge Ave., New Kensington, Pa.; chemist.
*TURNBULL, JOHN E., Apt. 5, 580 Blaine Ave., Akron, Ohio; U. S. Stoneware Co.
*TYRRELL, MILES E., 935 Main St., Wayne, Neb.; Basic Refractories Co.
WAGNER, RIO B., 4540 E. Main St., Columbus, Ohio; sculptor and designer.
WEIGEL, ROBERT C., 121 E. Pleasant St., Mexico, Mo.; Mexico Refractories Co.
WELTER, J. T., R. R. 3, Tiffin, Ohio.
*WESTALL, CHARLES C., Burns Apts., Kittanning, Pa.; Pittsburgh Plate Glass Co.

* Indicates former member of The Society rejoining.

Student

Missouri School of Mines: WALTER H. KIBURZ, JR.
New York State College of Ceramics: FRANK L. CORNISH, MISS JEWELL KARPEL, ABBOTT POZEFSKY, AND JOEL RABINOWITZ.
Ohio State University: JUAN H. ALVAREZ.
Pennsylvania State College: FRANK A. RUGH, JR., AND BETTY A. UTTER.
University of California: PO KAY WONG.
University of Illinois: LOUIS M. DONEY AND JAMES D. GRIFFITH.

MEMBERSHIP WORKERS' RECORD

CORPORATION: R. F. Brenner 1, A. T. Green 1, R. R. Shively 9, C. F. Tefft 1, C. J. Uhrmann 1, D. E. Walsh 5, Office 4.

PERSONAL: A. E. Austin 1, C. R. Austin 4, L. W. Austin 1, G. J. Bair 1, J. R. Beam 1, R. E. Birch 1, R. F. Brenner 1, Fred Buzard 1, Charles Casamo 1, G. P. Cole 1, S. F. Cox 1, C. E. Fulton 2, R. F. Geller 1, H. C. Harrison 1, J. C. Hostetter 1, F. L. Jones and Norbert Kreidl 1, M. A. Knight, Jr. 1, Norbert Kreidl 1, E. E. Kunzman 1, K. B. McAlpine 1, F. K. Pence 1, R. R. Robinson 1, W. F. Rochow 1, R. Russell, Jr. 1, R. M. Shremp 1, Sidney Speil 1, C. D. Spencer 1, G. H. Spencer-Strong 1, J. K. Stevenson 2, V. C. Swicker 1, J. E. Wiss 1, Office 28.

STUDENT: A. I. Andrews 1, W. M. Cohn 1, E. C. Henry 2, P. G. Herold 1, H. R. Swift 1, A. S. Watts 1, Office 4.

GRAND TOTAL: 97

ROSTER CHANGES FOR APRIL†

CHURCH, MARSHALL T., 200 Orange Dr., San Antonio 1, Texas (Columbus, Ohio)
COFFMAN, WILLIAM N., Keystone Abrasive Wheel Co., Ellwood City, Pa. (Owosso, Mich.)
EATHERTON, C. Z., Pickard, Inc., Antioch, Ill. (Hunkers, Pa.)
FRONCZAK, EDWIN T., 197 Pittsburgh St., Uniontown, Pa. (Canton, Ohio)
GORNALL, HENRY A., 6907 Daisy Ave., Independence, Ohio (Newell, W. Va.)
HANEY, H. L., Harshaw Chemical Co., 1945 East 56th St., Cleveland, Ohio (Pittsburgh, Pa.)
JOHNSON, ARNOLD G., 810 Dixie Highway, Rossford, Ohio (Maumee, Ohio)
KEITH, WENDELL P., Ceramic Dept., Massachusetts Institute of Technology, Cambridge, Mass. (Chicago, Ill.)
LANTZ, DONALD L., 401 Murray Ave., Fairmont, W. Va. (Clarksburg, W. Va.)
PESKIN, WILLIAM L., 147 Rossiter Rd., Rochester, N. Y. (New York, N. Y.)
RAINE, FRANK F., 19 Clifton St., Pittsburgh 10, Pa. (Concord, Calif.)
RHODES, DANIEL, 192 Oak Court, Palo Alto, Calif. (Saratoga, Calif.)
ROSS, DONALD W., B. Mifflin Hood Brick Co., Daisy, Tenn. (Binghamton, N. Y.)
STEWART, JACK, Calle Pericon 14, Cuernavaca, Mor., Mexico (Inglewood, Calif.)
TAIT, LEONARD G., Cia. Geral de Engenharia para America do Sul, Predio Conde Matarazzo, Rua Dr. Falcao Filho 56, Sao Paulo, Brazil (Grosse Pointe Farms, Mich.)
VAUGHAN, T. CARTER, 2736 Powhatan Parkway, Toledo, Ohio (Hartford, Conn.)
WILSON, EARL O., 457 West 7th St., Claremont, Calif. (Peking, China)
WITZEMANN, A. WILLIAM, 400 N. McKean St., Kittanning, Pa. (Youngstown, Ohio).

† Address in parentheses is former address.

REPORT OF COMMITTEE ON CERAMIC EDUCATION

As would be expected, there are few ceramic students left in the schools. Not only is the draft taking most of the students but some of the staff members are also being called. The new Selective Service ruling will just about complete the job except for girls and 4-F's.

The Ceramic Educational Council held its meeting April 2 at 12:00 M., at which time postwar plans were discussed. An independent statement from some of our ceramic school heads to this Committee, however, brought out some interesting ideas:

(1) Refresher and rehabilitation courses may be given to men returning from service who did not complete their work and to recently graduated men.

(2) One school favors adding certain courses to postwar curricula which will bring a closer tie between industry and the schools.

(3) Several schools believe that the war has taught us that science and technology are of greater importance to the ceramic graduate than the more so-called engineering courses. One school head expresses it with a quotation from Bleininger: "Stick to fundamentals, as the industries can teach practical experience better than the universities."

Several of these men express concern about E.C.P.D. recognition. One feels that such fundamental training may not affect our standing in E.C.P.D. Another feels that he does not care so much about E.C.P.D. as such fundamentally trained men would serve industry better owing to the nature of the ceramic field.

—H. M. KRANER, *Chairman*,
Bethlehem Steel Company, Bethlehem, Pa.

Synergistic Thought Investments

At the Forty-Sixth Annual Meeting

By 1290 Registered Persons

Were So Greatly Appreciated That

Forty-Two Persons and Seven Corporations Joined

The American Ceramic Society

At the Meeting

Ceramists From All Parts of North America

Maine to California

Canada to Mexico

Profited from Those Record-Best Technical Programs

The Value of This Synergistic Society

Is Increasingly Appreciated

PAID MEMBERSHIP AND SUBSCRIPTION RECORD

Date of Record	Members Paid		Deferred	Subscriptions	Monthly Sales	Total Circulation
	Personal	Corporation				
January 21, 1943	2079	267	11	444	220	3021
February 21, 1943	2095	267	10	451	220	3043
March 21, 1943	1765	262	8	416	220	2671
April 21, 1943	1909	266	18	442	220	2855
January 21, 1944	2110	323	4	531	220	3188
February 21, 1944	2147	330	4	540	220	3241
March 21, 1944	1844	323	4	523	220	2914
April 21, 1944	1996	344	3	560	220	3123

MEMBERS IN SERVICE *

The following members of this Society are in fighting units of war service. There are several in service in Washington not included in this Service Roster. This list, which was begun September, 1942, and added to each succeeding month, is probably not complete, and we would appreciate information on other members.

(272) CLIFFORD S. BALSER, Homer Laughlin China Co., Newell, W. Va.
(273) ROBERT H. BOLLINGER, Bausch & Lomb Optical Co., Rochester, N. Y.
(274) EDWIN T. FRONCZAK, Republic Steel Corp., Canton, Ohio.
(275) L. A. LANGE, United Clay Mines Corp., East Liverpool, Ohio.

* These are in addition to the lists published monthly, beginning with the September, 1942, *Bulletin*, with the exception of the June, 1943, issue.

CERAMIC EDUCATIONAL COUNCIL

REPORT OF COMMITTEE ON EXTENSION AND POSTWAR REHABILITATION

I. Introduction

The purpose of this report is to present the results of a survey of the postwar plans of the various ceramic institutions together with recommendations of the Committee pertaining to the subject of training and education in the field of ceramics during the period of discharge of war veterans and in the immediate postwar period.

II. Survey

A letter requesting the latest information on postwar plans of the various ceramic institutions was sent to eighteen colleges and universities. The replies to this letter have been examined and the results tabulated as follows:

RESULTS OF SURVEY

Inquiries sent	18
Number of replies	13
General university or college plans	9
Specific ceramic plans (other than regular curricula)	8
(1) Vocational courses for industry	5
(2) College-grade refresher or review courses	
(*a*) For undergraduates	5
(*b*) For graduates entering industry	6
(*c*) For graduates entering graduate work	4
(3) Special graduate courses	3
(4) Extension courses for industry	5
(5) Occupational therapy in ceramics	1

Many of the replies contained questions rather than answers. The most pertinent questions are as follows:

(1) How will physically handicapped veterans be placed after training?

(2) What credit will be given for military service, A.S.T.P. courses, and other training and education offered by the armed forces?

(3) What special considerations can be given to returning veterans?

(4) How can the enrollment in ceramic curricula be maintained at a level high enough to supply the anticipated demands?

III. Discussion

Veterans of the war are already being discharged at a rather rapid rate. This rate of discharge will increase as times goes on, reaching the maximum shortly after hostilities end. The period of discharge will continue probably for two, three, or perhaps as long as five years. During the early part of this period there will be a shortage of young high-school graduates who will be able to take advantage of collegiate training in ceramics due to the continued induction of young men reaching eighteen years of age. It is reasonable to predict that during the next few years the principal educational service which the colleges and universities of the country can render will be in the field of rehabilitation of war veterans through various education and training programs.

Legislation regarding disabled veterans has been passed by Congress to provide up to four years of training for any veteran who is at least 10% disabled. He receives $80 per month plus the entire cost of training, if single, and an additional $10 for a wife and $5 for each child, if married. The Veterans' Administration is now setting up the necessary administrative machinery throughout the country.

Congress is also considering legislation to aid discharged veterans who are not disabled to obtain education or training before they return to civilian pursuits. Although no legislation has been passed to date, the present trend of the proposed legislation indicates that the Government will finance at least one year of training for all discharged veterans and additional training for those who show outstanding ability warranting additional education. The proposed legislation also provides allowances for living expenses during the training period in addition to the actual expense of the education. If this legislation passes Congress, there is little doubt that a large number of discharged veterans who have had some technical training, or who are interested in a technical field, will take advantage of the opportunity to obtain the additional education or training which will be allowed at federal expense. Government officials have estimated that about 7% of the veterans will wish additional education.

IV. Recommendations

In view of the general facts regarding discharged servicemen, the legislation already passed and being considered by Congress, and the result of the survey made by this Committee, the following recommendations are offered:

(*A*) All institutions offering work in ceramics are urged to make some plans to provide for the special problem of educating and training discharged service men and women. As there is now a critical shortage of ceramic technologists and engineers and this situation will continue until it is alleviated by the specific training of persons in the field of ceramics, it is the responsibility of ceramic institutions to make provision for training and education programs.

(*B*) The Veterans' Administration and other interested agencies should be presented with a proper and concise statement of the possibilities of ceramic training and educa-

tion, the possible training programs available, and the institutions having facilities to offer these programs.

(*C*) Any plans or programs should be kept as flexible as possible to provide for the multitude of problems which are certain to accompany all educational work in the postwar period.

(*D*) No modifications of existing curricula should be made which would detract in any way from the present high standard of college-grade ceramic education.

(*E*) The present curricula should be kept on an accelerated basis until the shortage of ceramic technologists and engineers in industry is relieved.

(*F*) Insofar as possible and where the proper circumstances justify, the following types of programs should be considered for the education and training of discharged servicemen and others:

(1) Courses giving special consideration to returning war veterans in the field of ceramics, as required by the circumstances.

(2) A series of education and training programs set up on a basis of time not to exceed one year, in view of the present legislative trend.

(3) The following types of educational programs:

(*a*) Less than college-grade extension vocational programs for persons returning directly to industry, to be offered in close cooperation with industry.

(*b*) College-level (credit or noncredit, extension or residence) vocational courses to train ceramic technicians (with the option of continuing regular work toward a degree).

(*c*) Review or refresher programs at the following levels:

(1) For undergraduates who have partially completed the requirements for the Bachelor's degree.

(2) For graduates desiring to enter industry or to pursue graduate work.

(3) For graduates who have entered industry (graduate courses given in the evening or through extension).

(4) The maximum use of the occupational therapy value of ceramic materials (clay, glass, etc.) for the rehabilitation of disabled veterans by offering courses independently or in cooperation with other departments or agencies.

—E. P. McNAMARA, *Chairman*,
Rutgers University, New Brunswick, N. J.

COMMITTEE REPORTS

REPORT OF COMMITTEE ON STANDARDS

The American Ceramic Society is a technical society for the advancement of the silicate and other earthy nonmetallic industries and consequently is interested in definitions, specifications, and methods of tests that pertain to these industries. The Society has representation in many organizations whose principle activities deal with such standards work. In many cases, the majority of the membership of these organizations is made up of members of The American Ceramic Society.

The Divisions of The Society have Standards Committees. Many of these Committees have been active in writing definitions, specifications, or methods of testing which, when applicable, have been adopted by the standard organization most interested. Lacking an interested standards organization, the standard is presented through the Standards Committee to the Board of Trustees for adoption by The Society. These Division Standards Committee chairmen are ex-officio members of the Standards Committee of The Society and consequently may have a voice in the adoption of standards by The Society.

This report of the Standards Committee is a compilation of the reports of the representatives of The Society on organizations dealing with standards and the reports of the Division Standards Committees.

During 1943, a large amount of standards work was accomplished. Much of this was secret war work that cannot be published, and consequently many of the reports of work of organizations are short and contain little information that is of interest. Some of the organizations on which The Society has representation have discontinued activities for the duration because of more important war work or because of the difficulties of transportation and lack of hotel accommodations. Undoubtedly after the duration many of the standards activities of the war period will be made public by some and there will be renewed activity by others.

American Foundrymen's Association

L. C. HEWITT, Laclede-Christy Clay Products Co., St. Louis, Mo.: A meeting of the Joint Committee on Foundry Refractories was held in April, 1943, in conjunction with the annual meeting of the American Foundrymen's Association. As members of the Committee were engaged in their own jobs in connection with war work, there was no activity in this Committee during the past year.

American Society for Testing Materials

Committee A-1 on Steel, H. F. STALEY, Metal & Thermit Corp., 120 Broadway, New York, N. Y.: This Committee transacted no business during the year that had any interest to the members of The Society.

Committee C-4 on Clay Pipe, C. M. DODD, Dept. of Ceramic Engineering, Iowa State College, Ames, Iowa: Although Committee C-4 has been active during the past year, the Committee has not been together in formal session.

Agreement has been reached within the Committee on Standard Specifications for Clay Sewer Pipe, C13-40, to bring the specifications requirements into conformity with those of Federal Specifications S.S. P-361a for Standard Pipe. No formal Committee action, however, has been taken.

In addition to the foregoing, the Committee has considered whether or not salt glazing of sewer pipe should be required in the specifications; also, whether or not the dimensions of extra-strength, clay sewer pipe should be based on uniform inside or outside diameter. Formal Committee action has not been taken on either of these questions.

Specifications have been tentatively written for extra-strength, clay sewer pipe which conform to the Federal Specifications and these will be submitted for Committee action as soon as agreement is reached as to how the diameter is to be measured.

Committee C-6 on Drain Tile, J. LEO CHILD, Hancock Brick & Tile Co., Findlay, Ohio: There has been no activity of this Committee during the war period; extensive postwar plans, however, have been made.

Committee C-7 on Lime, CHESTER R. AUSTIN, Battelle Memorial Institute, Columbus, Ohio: The activities of the Committee can be summarized as follows:

(1) Master specifications covering quicklime and hydrated lime for industrial uses are being prepared. If accepted, these specifications will replace the separate standards now in effect for the different industries employing lime.

(2) An autoclave test for the determination of soundness of lime is under consideration.

(3) Data on sand-carrying capacity vs. workability will be determined for hydraulic limes.

Committee C-8 on Refractories, J. W. WHITTEMORE, Virginia Polytechnic Institute, Blacksburg, Va.: Because of war conditions, only one meeting of the Committee was held during the year; the activities, however, have resulted

in considerable constructive accomplishments, e.g., the recommendation by the Committee for the acceptance for publication of the list of symbols pertaining to the heat-flow standard of the A.S.A. as a new tentative standard, C108–44T. The statement of scope of the tentative specifications for Air-Setting Refractory Mortars (Wet Type) for Boilers and Incinerator Services (C178–43T) was amended by adding to the end of the paragraph "unless otherwise specified, high heat-duty mortar shall be supplied."

Many laboratories were circulated to determine their opinions on the use of P.C.E. cones in the Pyrometric Cone Equivalent Test of Refractories. The opinion was nearly unanimous for the description of a test cone mold to be included in the Refractories Manual of the Committee, and a drawing has been prepared of the excess-length type of split mold.

A tentative revision of the Standard Specifications for Ground Fire Clay as a Mortar for Laying up Fire-Clay Brick (C105–41) has been recommended which provides either the purchaser or the manufacturer a resample and retest upon request.

The surveys of the industrial use of refractories are being continued with new projects on the refractories used for water-gas generators, in the oil industry, in open-hearth practice, in by-product ovens, and in the lead industry.

Committee C–11 on Gypsum, H. E. SIMPSON, Mellon Institute, Pittsburgh, Pa.: This Committee, under the chairmanship of Mr. Wells of the National Bureau of Standards, has not met, nor has any work been transacted during 1943.

Committee C–14 on Glass and Glass Products, G. W. MOREY, Geophysical Laboratory, Washington, D. C.: The Committee has raised the following methods to standards during the last year:

Chemical Analysis of Glass Sand C146–43.
Hydrostatic Pressure Test on Glass Containers C147–43.
Polariscopic Examination of Glass Containers C148–43.
Thermal-Shock Test on Glass Containers C149–43.
Flexure Testing of Glass C158–43.
Chemical Analysis of Soda-Lime Glass C169–43.

Subcommittee I is busy revising the Tentative Definition of the Term "Glass," C162–41T.

Suggestions for the establishment of new committees are under way. Subcommittee VII on Glass Containers has Section A devoted to pharmaceutical containers. Subcommittee VIII on Flat Glass is working out a program to review test methods used in specifications.

Committee C–15 on Manufactured Masonry Units, J. W. Whittemore, Virginia Polytechnic Institute, Blacksburg, Va.: Tests, for efflorescence and for rate of absorption for brick, of the Methods for Testing Brick C67–41T were advanced to standard during the year. The Specification for Building Brick (made from clay or shale) C62–41T was advanced to standard. These changes have clarified these tests and made possible easy interpretation and use of the Methods of Tests and the Specification. The Specification for Concrete Masonry Units C90–39 was revised slightly.

A proposed specification for glazed brick and tile which is similar to that of the Glazed Brick and Tile Institute was adopted during the year.

The specifications for structural clay tile C34 and C56 have been reviewed to determine changes that could be made to make them conform more closely with the Federal Specifications.

Committee D–3 on Gaseous Fuels, C. H. PARMELEE, Onondaga Pottery Co., Syracuse, N. Y.: Progress was reported on the various subjects and topics assigned to each subcommittee, but this progress is slower than usual due to the conflict with present war programs of the Committee members. All subcommittees are as active as possible under the present conditions. Committee D–3 as a whole is meeting only once a year under the present conditions.

Committee D–9 on Electrical Insulating Materials, L. E. BARRINGER, General Electric Co., Schenectady, N. Y.: The following is a brief summary of the activities of this Committee showing changes which have been effected during the past year in the A.S.T.M. standards relating to glass and ceramic materials.

(1) Tentative specifications established for Low and Medium Voltage Pin-Type Lime Glass Insulators.

(2) The following tentative A.S.T.M. standards were advanced to standard:

(*a*) Tentative revision of D116–42 relating to Dye Penetration (see page 9, Committee D–9 booklet, Dec., 1942).

(*b*) D550–41T: Tentative Methods of Testing Glass Spool Insulators.

(*c*) D667–42T: Tentative Methods for Testing Steatite Used as Electrical Insulation.

(3) An alternative method (Preston machine method) for determining resistance to thermal shock of Pin-Type, Lime Glass Insulators has been developed. A paper discussing this testing procedure will be published in the A.S.T.M. Committee D–9 booklet for 1943–1944. It is planned to include this method in D468–42.

American Society of Mechanical Engineers

Petroleum Division, H. R. STRAIGHT, Straight Engineering Co., Adel, Iowa: There were no activities during the year of interest to the ceramic industries.

American Standards Association

Sectional Committee on Specifications for Drain Tile (Project A–6), J. LEO CHILD, Hancock Brick & Tile Co., Findlay, Ohio: There has been no activity of this Committee during the war period. Extensive postwar plans, however, have been made.

Sectional Committee on Minimum Requirements for Plumbing and Standardization of Plumbing Equipment (Project A–40), HARRY WHITTAKER, Crane Co., Research and Development Labs., Chicago, Ill.: The final draft on the American Standard for Air Gaps and Back-Flow Preventers in Plumbing Systems, A40, was received and reported last year. The previously approved Standard on Air Gaps and Plumbing Systems was incorporated with the Standard on Back-Flow Preventers.

The finally approved standard designated as Air Gaps and Back-Flow Preventers in Plumbing Systems A40.4 (January, 1942) and A40.6 (June ,1943) was published.

The American Standard for Threaded Cast-Iron Pipe for Drainage, Vent, and Waste Services, which was voted on by letter ballot April 29, 1942, has been approved and was published June, 1943, as American Standard Threaded Pipe for Drainage, Vent, and Waste Services, A40.5. This standard should be of interest to the Structural Clay Products Division in connection with clay pipe and sewer pipe, as physical properties, sizes, tolerances, and hydrostatic tests are specified. The standard is also of interest to producers of sanitary-ware products.

Sectional Committee on Recommended Practice for Brick Masonry (Project A–41), J. W. WHITTEMORE, Virginia Polytechnic Institute, Blacksburg, Va.: During the year, revisions were made on the Building Code Requirements for Masonry. With these revisions the specification was adopted as standard. The specification will serve as a very complete source for all information on masonry construction.

Sectional Committee on Coordination of Dimensions of Building Materials and Equipment (Project A–62), FREDERICK HEATH, JR., Owens-Corning Fiberglas Corp., Toledo, Ohio: Major accomplishments of the past year include the publication of two documents issued to the building industry for criticism and suggestions. They are as follows:

(1) Proposed American Standard Basis for the Coordination of Dimensions of Building Materials and Equipment—A62.1 (see *Bull. Amer. Ceram. Soc.*, **22** [12] 417–18 (1943) and **23** [1] 28–31 (1944)).

(2) Proposed American Standard Basis for the Coordination of Masonry—A62.2.

An application standard under the title "Proposed American Standard Coordinated Sizes for Structural Clay Products—A62.3" is under preparation by the Structural Clay Products Institute under the direction of Harry C. Plummer, director of Engineering and Research.

A similar application standard to be designated A62.4 is being prepared for concrete masonry through the sponsorship of the National Concrete Masonry Association.

The Committee has prepared a Dimensional Coordination Guide which was released March 15, 1944. This is under the sponsorship of A62 Study Committee No. 7 on Building Layout and designed to assist architects in the application of modular design.

Application studies are under development also for both metal and wood windows and doors.

The Committee has had excellent support from both of its sponsors, The American Institute of Architects and the Producers' Council, Inc., through resolutions endorsing the proposed standards, encouraged acceptance of them, and the development of application standards in conformity thereto.

These organizations request architects to consider modular design in connection with working drawings for postwar buildings being prepared now.

Sectional Committee on Insulators for Electric Power Lines (Project C–29), G. W. LAPP, Lapp Insulator Co., Le Roy, N. Y.: A report on the activities of this Committee for the past year should include the revision dealing chiefly with temperature cycle tests upon which a vote is now being taken. A meeting discussing this proposed revision was attended February 24, 1944.

It is proposed to provide a lower thermal-shock range for insulators below 85 kv. flashover. This will provide a 70°F. temperature range for the testing of soda-lime glass insulators which have not in the past met the 166° range or the 110° standard range for porcelain insulators.

Although not under the C–29 Committee, there has been much activity in the field of insulators for communications in which most ceramic insulator manufacturers are interested.

Under American War Standards adopted, the following are listed:

Ceramic Radio Insulating Materials, Class L (C75.1—1943)
Steatite Radio Insulators (C75.2—1943)
Ceramic Dielectric Radio Materials, Class H (C75.4—1943)
Glass-Bonded Mica Radio Insulators (C75.16—1943)
Glass Radio Insulators (C75.8—1943)
Porcelain Radio Insulators (C75.14—1944)

This summarizes for reference a very active year in ceramic insulator standards.

Sectional Committee on Scientific and Engineering Symbols and Abbreviations (Project Z–10), RALSTON RUSSELL, JR., Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.: There has been no activity of this Committee that would be of interest to the members of The American Ceramic Society.

Sectional Committee on Specifications for Sieves for Testing Purposes (Project Z–23), A. S. WATTS, Ohio State University, Columbus, Ohio: This Committee has received no assignments since the report submitted last year.

Sectional Committee on Specifications and Methods of Test for Safety Glass (Project Z–26), GEORGE B. WATKINS, Libbey-Owens-Ford Glass Co., Toledo, Ohio: The activities of this Committee were temporarily suspended for the duration and no meetings were held during 1943.

International Association for Testing Materials

S. M. PHELPS, American Refractories Institute, Mellon Institute, Pittsburgh, Pa.: The work of this organization in the field of refractories apparently has been dormant during the past year.

International Commission on Glass Technology

J. C. HOSTETTER, Mississippi Glass Co., St. Louis, Mo.: Because of the war it has been difficult to conduct the usual activities of the Commission. The organizations have kept contact with and posted on the activities of the others.

International Chemical Congress

ALEXANDER SILVERMAN, University of Pittsburgh, Pittsburgh, Pa.: As no International Chemistry meetings have been held since 1938, there are no activities to report.

Inter-Society Color Council

I. A. BALINKIN, University of Cincinnati, Cincinnati, Ohio: The main activity of the delegates to the Council centered around participation in a discussion session on "Small Color Differences." The program was organized by the Inter-Society Color Council and cosponsored by the American Association of Textile Chemists and Colorists and the Federation of Paint and Varnish Production Clubs.

In response to a request sent to every delegate, a program of papers was organized on the subject of "How Color Tolerances Are Met in Ceramic Industries," in which the following delegates participated: Richard S. Hunter, Campbell Robertson, N. J. Kreidl, V. H. Remington, and Isay A. Balinkin. Two written communications were also presented from A. S. Watts and Edward Schramm. Plans are now under way for the publication of these discussions.

The interest shown by the delegates in the subject of measuring colors and establishing color tolerances may be taken as an indication that another symposium on similar topics may be undertaken by The American Ceramic Society in cooperation with the Inter-Society Color Council.

National Research Council

G. W. MOREY, Geophysical Laboratory, Washington, D. C.: All of the projects under consideration are classified as secret and for that reason cannot be reported at this time.

United States Department of Commerce, Division of Simplified Practice, Permanent Committee on Simplification of Variety and Standards of Vitrified Paving Brick

C. C. BLAIR, Metropolitan Paving Brick Co., Canton, Ohio: The activities of this organization have been suspended for the duration of the war.

DIVISION REPORTS

Enamel Division, R. L. COOK, University of Illinois, Urbana, Ill.: The various published reports of the Enamel Standards Committee have been reviewed during the past year. In the early work, the primary purpose of the Committee was to take part in the actual formulation and setting up of test methods. In one of the early published reports of the Enamel Standards Committee, Poste[1] reported that the particular interest was in the standardization of methods of control. The following topics were considered: (1) enamel raw materials, (2) flotation of enamels, and (3) opacity of enamels. In the Enamel Standards Committee Report for 1925–1926, Poste[2] presented the review of the work on (1) flotation of enamel and related problems, (2) opacity, color, reflecting power, and associated properties, (3) standardization of raw materials, and (4) standardization of control tests.

In the Enamel Standards Committee report for 1926–1927[3] two tests were reviewed, and the Committee recommended them to the General Standards Committee for adoption as tentative tests: (1) the Deformation Temperature of Enamel and (2) Fineness of Wet-Milled Enamel.

In the report of the Enamel Division Standards Committee for 1927–1928,[4] the Committee took the position that its function is to study tests that come to its attentoin rather than to originate tests. In the Committee report for 1929,[5] several tests and test methods were reviewed. The two previously adopted tentative tests (Deformation Temperature of Enamel and Fineness of Wet-Milled Enamel) were revised and another test (Tentative Method for Determining the Resistance of Sheet-Steel Enamel to Deflection) was recommended as a tentative standard.

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[1] *Bull. Amer. Ceram. Soc.*, **4** [4] 193 (1925); E. P. Poste, *Chairman.*
[2] *Ibid.*, **5** [5] 230–51 (1926); E. P. Poste, *Chairman.*
[3] *Ibid.*, **6** [9] 259–80 (1927); E. P. Poste, *Chairman.*
[4] *Ibid.*, **7** [12] 347–67 (1928); E. P. Poste, *Chairman.*
[5] *Ibid.*, **8** [9] 273–93 (1929); E. P. Poste, *Chairman.*

In the report of the Enamel Division Standards Committee in 1930,[6] two tests were recommended to the Division for adoption as standard tests: (1) Fineness of Wet-Milled Enamel and (2) the Deformation Temperature of Enamel. This recommendation was approved by the Division. In the report of the Enamel Division Standards Committee for 1932,[7] the various subjects considered were (1) methods for the determination of the resistance of vitreous enamels to corrosion, (2) mechanical impact, (3) thermal shock, (4) abrasion, and (5) fusion flow properties.

In the Committee report in 1935,[8] it was proposed that the Committee should concentrate its efforts on tests of enameled products rather than on tests of materials. A consideration was given to the properties of enameled products on the following basis: (1) Surface: Acid resistance, opacity, gloss, color measurement, and resistance to abrasion; (2) Body: Crazing, chipping, resistance to impact, thermal shock, and flexure or tensile and compressive strength; and (3) Interface: Adherence, reboiling, and coefficient of expansion.

In the Enamel Division Report of the Committee of Standardization of Tests,[9] a rather comprehensive review of the material published in 1935 and in 1936 was presented.

The Enamel Division Standards Committee Report for 1939[10] recommended that the Enamel Division should accept as standard those tests which the Porcelain Enamel Institute has given final approval. It was further recommended that the Enamel Division should (1) approve and send to the Committee on Standards of The American Ceramic Society for adoption as standard tests the two standard tests of the Porcelain Enamel Institute entitled "Reflectance Test for Opaque White Porcelain Enamels" and "Test for Acid Resistance of Porcelain Enamels" and (2) slightly modify the standard method for fineness of wet-milled enamels so that the fineness could be expressed on a percentage basis of the original sample. There is no record as to whether these tests were approved.

In the Enamel Division Standards Committee Report for 1941,[11] the Committee again recommended for adoption the two aforementioned tests. No report as to the disposition of the recommendation was found.

It appears, therefore, that the Enamel Division has had only two tests approved as standard tests, and one tentative standard test, and those back in 1930. Other tests have been proposed, but there is no record pertaining to their acceptance.

In carrying out the proposal set forth in the Enamel Division Standards Committee Report for 1943,[12] the members of the Standards Committee reviewed and examined critically the various tests of the National Bureau of Standards, the Porcelain Enamel Institute, and the Enameled Utensil Manufacturers' Council with the view of recommending specific tests for adoption as Standard Tests of the Enamel Division.

To establish a definite procedure for considering tests, the Standards Committee proposes that

(1) The Enamel Division adopt a specific procedure for the consideration of tests as follows:

(*a*) The Standards Committee to make recommendations to the Enamel Division.

(*b*) The Enamel Division to vote for approval or rejection of the proposed test.

(*c*) Standard tests approved by the Enamel Division to be recommended to the Committee on Standards of The American Ceramic Society for final approval by the Board of Trustees.

After a consideration of the various tests, the Committee makes the following recommendations for adoption as standard tests:

(1) Reflectance Test for Opaque White Porcelain Enamels.

(2) Test for Acid Resistance of Porcelain Enamels (Flatware).

For adoption as tentative standards:

(3) Test for Resistance of Porcelain Enamels to Gouging.

(4) Impact Test for Enameled Utensils.

(5) Solubility Test for Enameled Utensils.

In addition, the various committee members held a symposium on the Review of Tests and Standards at the Pittsburgh meeting.

Glass Division, F. W. Adams, Pittsburgh Plate Glass Co., 4337 Fifth Ave., Pittsburgh, Pa.: Several members of the Glass Division on A.S.T.M. and A.S.A. committees are interested in standards for glass. Through their activity the interests in standards of the Division are activated. Attention should be given to the reports of A.S.T.M. Committee C–14 and A.S.A. Project Z–26.

Structural Clay Products Division, E. F. Theobald, Metropolitan Paving Brick Co., Canton, Ohio: Most of the standards activities of this Division are handled through the committees of A.S.T.M. on which there are several members of the Division. Attention should be given to the reports of the A.S.T.M. Committees C–4, C–6, and C–15.

White Wares Division, F. P. Hall, Pass & Seymour, Inc., Syracuse 9, N. Y.: During the year, considerable effort has been given to the work of the American Standards Association for 1943. Specifically there are three or four projects completed which are directly applicable to the White Wares Division. The personnel of the committees performing this work is mainly that of men from the Division with radio engineers.

The standards completed by this A.S.A. committee of interest to the members of The Society are as follows:

Ceramic Radio Insulating Materials, Class L–C75.1—1943

Steatite Radio Insulator—C75.2—1943 (First Revision)

Ceramic Radio Dielectric Materials, Class H–C75.4—1943

Porcelain Radio Insulators—C75.14—1944

All of these are very comprehensive and have required a great deal of effort in preparation.

The Standards Committee of The American Ceramic Society recommends to the Trustees that if and when the aforementioned standards are adopted by the Enamel Division that they shall be adopted by the Trustees for The Society.

This report is respectfully submitted to the Board of Trustees of The Society with appreciation to the various representatives of The Society who have made possible this report by their contributions.

—J. W. Whittemore, *Chairman*,
Virginia Polytechnic Institute, Blacksburg, Va.

REPORT OF COMMITTEE ON AIR HYGIENE

There has been no active work by this Committee during the year, as no problems have been presented for the Committee's action.

The Committee wishes to report, however, that, inasmuch as the first phase of silicosis problems is partly over (the phase which represented a racketeering angle), there is a new period evolving in which legislation is being developed to take care of the compensation angle. This is thoroughly presented every year by T. C. Waters at the annual meeting of the Industrial Hygiene Foundation.

There is a growing interest in plant surveys followed by plant hygiene for protection against air-borne liabilities to operation. These surveys include not only silica dust but other fumes, gases, irritating dusts, and even carriers of infection.

This Committee feels that any plant which suspects it has a situation has its best defense in ascertaining the facts by obtaining a reliable survey of the problems which

[6] *Bull. Amer. Ceram. Soc.*, **9** [9] 269–71 (1930); R. D. Cooke, *Chairman*.
[7] *Ibid.*, **11** [5] 130–34 (1932); C. J. Kinzie, *Chairman*.
[8] *Ibid.*, **14** [2] 81 (1935); D. G. Bennett, *Chairman*.
[9] *Ibid.*, **15** [8] 276–80 (1936); D. G. Bennett, *Chairman*.
[10] *Ibid.*, **18** [6] 215 (1939); C. R. Amberg, *Chairman*.
[11] *Ibid.*, **20** [5] 176 (1941); Clark Hutchison, *Chairman*.
[12] *Ibid.*, **22** [9] 315 (1943); R. L. Cook, *Chairman*.

should tell them whether or not the plant should be cleaned up from an engineering standpoint.

If such preventative measures are reasonably taken, they stand as a good protection against fraudulent claims as well as against time lost and liability to employees due to what used to be an unknown or an ill-defined hazard.

Considerable literature on this subject is available, some of which the Committee can obtain for members who desire it.

—FRANCIS C. FLINT, *Chairman*,
Hazel-Atlas Glass Company, Washington, Pa.

REPORT OF COMMITTEE ON MEMBERSHIP

A moderate increase in the total membership has been realized during the past year, despite the normal loss coincident with the entrance of members into the armed services. The Chairman wishes to express deep appreciation to the many who have cooperated in the membership effort, and particularly to President C. E. Bales for his continued advice and intense personal effort and to General Secretary R. C. Purdy and his staff for their ready cooperation at all times.

As we are now primarily interested in future plans, the remainder of this report will deal with those plans and the various factors involved.

With the approval of C. E. Bales and President-Elect E. H. Fritz, the Membership Committee is organizing a program which it is hoped will result in doubling the current membership. There are ample potential members, both Personal and Corporation, to more than justify this goal. The plans call for a substantial gain in members during each of the next few years, with the net result being a total membership of possibly 5000 by 1947.

The membership campaign will have as its slogan, DOUBLE THE MEMBERSHIP, and will be given definite publicity through *The Bulletin*. Regular reports of progress will be made. The following discussion relates directly or indirectly to this membership effort, and it is hoped that those points in question will receive the necessary attention of the Board of Trustees.

(*1*) *Solicitation by Current Membership.* By means of letters and publicity in *The Bulletin*, it is hoped that all current members will become membership-conscious. This may involve a certain amount of educational work in many instances and will undoubtedly require continued encouragement by the Committee. There is no better soliciting group than those members who become convinced of the desirability of promoting membership, and the more who will contribute the greater will be the combined result. Establishment of an "Honor Roll" page in *The Bulletin* to insure due credit for successful solicitation will be considered.

(*2*) *Special Membership Committee.* Each Division will be represented on the Membership Committee by a well-known and outstanding individual who has been selected and advised of the desirability of conducting an intensive membership drive within his Division. Each appointee will organize and direct a Divisional Committee. C. E. Bales provided the incentive for the formation of this special Committee through his very successful personal solicitation within the Refractories Division during the past year.

(*3*) *Potential Membership with Production Interests.* The Society recognizes that a great number of potential members exist in the person of production supervisors, foremen, and shopmen. Steps have recently been taken to plan programs of less technical and less highly scientific nature to supply interests for these men. The Society has a general policy of extending its scope to provide for both technical and production personnel, and a proper balance between these will be maintained insofar as possible. All those interested in membership solicitation will be urged to prospect the field of production or plant men to acquaint them with The Society's desire and ability to serve their interests.

(*4*) *Activities of Papers and Program Committees.* Following up similar efforts of C. E. Bales, E. H. Fritz called a meeting of all Divisional Chairmen to counsel them as to the desirability of objectively planning programs which provide the proper interests for production men. With the Divisional Chairmen and their Program Committees sufficiently conscious of the need for programs of a practical nature, it will be possible to make program plans far in advance and to devise programs having the proper balance between scientific and practical papers. With The Society and its Divisions continually cognizant of its opportunity to serve production men and plant operators, the job of selling membership to this group should be made easier. Those responsible for programs should periodically be reminded of The Society's obligations to those interested primarily in manufacture.

(*5*) *Divisional Reorganization.* Various proposals have been made for a revision of The Society's Divisional structure, but the consensus of opinion is that the present setup is completely adequate for any anticipated expansion. One or more new Divisions may eventually be required, e.g., a Cement, Lime, and Gypsum Division and possibly a Mineral Aggregates Division.

It is the writer's opinion that possibly the Materials and Equipment Division should either be abolished or its function should be more concisely outlined to eliminate some of the present conflicts. This opinion is not directed at any of the members or officers of the Materials and Equipment Division, who have always been especially cooperative. It is believed, however, that the members of this Division are less interested in each other than in the various other Divisions. Most every paper assigned to a Materials and Equipment Division program could be beneficially heard by at least one of the other Divisions. It would seem to be logical to assign these papers to the interested Divisions and thus eliminate a source of program conflict. Many instances of such conflict can readily be cited, and in some cases entire programs have conflicted. Joint sessions of the Materials and Equipment Division with other Divisions have eliminated some confusion, but this is not always practicable. It is proposed that consideration be given to the following two alternative plans:

(*A*) Abolish the Materials and Equipment Division and assign its affiliated members to the Division or Divisions of their choice. The members would then contribute the same active support to their new Divisions.

(*B*) Maintain the structure of the Materials and Equipment Division, but abandon the arrangement of programs except on those special occasions when nonconflicting programs are possible. Under such an arrangement, the Materials and Equipment Division members would also be affiliated with at least one other Division and would actively engage in the affairs of that Division. If a separate Materials and Equipment Division Program Committee were still maintained under this setup, it would work in cooperation with other Divisions in the arrangement of joint programs and would assign any extra papers to the proper Divisional programs.

(*6*) *Society Prospectus.* Preliminary plans were made during the last year for the preparation of a prospectus outlining in concise form the interests and functions of The American Ceramic Society and providing membership data along with other general information pertinent to prospective members. Many of the leading technical and scientific organizations have such an organ for use in advertisement, and our Society could well afford the cost of this prospectus. Such a prospectus properly prepared will serve for many years possibly with slight periodic revision to keep it statistically accurate. It was tentatively planned to prepare this prospectus under the direction of the General Secretary at such time as it could be considered. Possibly an advisory or assisting committee would be helpful, particularly in determining the general form and content. The writer urges that this prospectus be made available at the earliest convenient date.

(*7*) *Causes for Disinterest.* In future membership solicitation, an attempt will be made to determine why various prospective members do not consider it desirable to become affiliated with The Society. A background of such information, if it can be obtained, will be of use to

The Society officers and Trustees in discussing future policies and will enable the Membership Committee to solicit more effectively.

(8) *Local Sections of The Society.* C. E. Bales has recognized the need for more and stronger Local Sections and has made substantial progress in improving the sectional situation. It is generally agreed that strong and active Local Sections are one means of readily extending the services of The Society and of justifying membership in the parent Society in many cases. This is particularly true as Local Sections can reach many persons, including numerous production men, who might only rarely have an opportunity to attend Annual Meetings. E. H. Fritz has indicated a strong desire to continue the improvement of those Local Sections which have not been functioning satisfactorily, and his Committee on Local Sections will continuously encourage all existing groups. It has been suggested, furthermore, that a survey be made of all territories where ceramic interests exist to determine the number of persons who might be organized into new Local Sections. Distance factors must be considered in such a survey. The most expedient method of conducting the survey would be to request one interested person in each prospective territory to accumulate the desired information. Some of the possibilities for new Local Sections may be listed, although there are undoubtedly reasons why no organization should be attempted in some of them. Such a list might include New England (Massachusetts), New Jersey, Eastern Pennsylvania, Georgia-Alabama, Southern Ohio and Kentucky, Eastern Ohio, Northwestern Ohio, Iowa, Texas, Minnesota, Wisconsin, Arkansas-Missouri, Washington-Oregon, Northern California, etc. This list is not meant to be complete, but merely to indicate the definite possibilities that do exist. The number of interested persons required for the formation of a new Local Section should be clarified.

(9) *Reclassification of Membership.* In the last report of the Membership Committee, published in *The Bulletin*, February, 1944, it was proposed that a plan for a reclassification of the membership be considered. The proposed plan was devised to include several classes of members depending upon age and to provide for increasingly higher dues with each change in age class. The general reaction to this proposal was unfavorable, but it is again brought to attention in view of its seeming importance to any large-scale membership effort and to the future of The Society. The need for a membership reclassification plan is based on the assumption that the amount of dues in many cases is a controlling factor in influencing many nonmembers not to join The Society or in causing some members to discontinue membership. This applies specifically to the younger members and membership prospects.

It is true that the younger age groups are less important now than normally, but the postwar era will again find them very prominent. The membership reclassification proposal is designed to yield a continuously increasing membership and to increase the number of members who sustain The Society for long periods, in contrast to temporary members who benefit The Society but little. The stable membership controls The Society's opportunities for service, and in turn gains the greatest benefits through mutual cooperation.

It is essentially true that membership in any Society becomes a matter of habit to a large extent, and the earlier and easier the habit is acquired the greater the possibility that it will be continued indefinitely. Moreover, the services of The Society during the habit-forming period are important, and every incentive should be offered to provide the opportunity for such service during this period. The Society cannot fully serve nonmembers, nor can they serve The Society effectively.

In view of the cumulative effect upon membership and The Society which would almost certainly come from a suitable reclassification of members, and in view of the ease with which a satisfactory plan can be put into effect, it is hoped that steps will be taken to adopt a suitable plan as soon as possible. Failure to do so will be a definite impediment to the procurement of new members and to insuring the largest number of continuously sustaining members through the coming years.

The Membership Committee requests the Board of Trustees and The Society officers to discuss and consider each of the points outlined in the foregoing report. Definite decisions of policy should be set forth in each case, whether those decisions be favorable or not to the proposals and plans outlined.

—Ralston Russell, Jr., *Chairman*,
Westinghouse Electric & Manufacturing Company,
East Pittsburgh, Pa.

REPORT OF COMMITTEE ON PUBLICATIONS

JOURNAL and *BULLETIN* Pages and Number of Papers Published 1940–1944

	Total papers received	*Journal*	*Bulletin**
1940	138	68 papers (366 pp.)	57 papers (502 pp.)
1941	139	64 " (408 pp.)	65 " (478 pp.)
1942	138	74 " (480 pp.)	43 " (332 pp.)
1943	101	61 " (430 pp.)	41 " (432 pp.)
1944	(Jan.–May)	28 " (164 pp.)	
		(Jan.–March)	9 " (104 pp.)

* *The Bulletin* total pages include papers, ceramic history, activities, and notes.

Present Status of Papers for Publication

In type for *Journal* (all preprints)	3
(*Journal* paged through May, 1944)	
In type for *Bulletin* (through April)	5
Papers in office (new)	5
Out for Editorial Review	4
Out for Author Revision	8
Total	25

Report on Ceramic Abstracts

	1942	1943
Number of abstracts and patents	3683	3316
Number of pages	310	268
Number of index pages	60	60

Abstracters now number 45, a slight increase over 1942. Four hundred and fifteen periodicals are being covered regularly.

Change in Weight of Paper for Society Publications

The printer's contracts have specified 25 x 28, 60-lb. paper for *The Bulletin* and *Ceramic Abstracts* and 25 x 28 50-lb. paper for *The Journal*. Beginning with the January, 1944, issues of our three monthly publications, a 45-lb. English finish paper is being used by amended WPB order L–120.

Comparison of Annual Meeting Programs for 1943 and 1944

Division	Number of Titles Listed 1943	1944
General	6	8
Design	21	11
Enamel	11	16
Glass	23	30
Materials and Equipment	15	11
Refractories	17	24
Structural Clay Products	16	18
White Wares	12	20
Total	121	138

Of the 121 titles on the 1943 Program, 75 papers have been received and published in *The Journal* or *Bulletin* or are now in process of publication. Fourteen papers were received and were rejected for publication. A few of the 1942 and 1943 Program papers are still given a definite promise of completion.

An analysis and comparison of the titles listed on the 1943 and 1944 Annual Meeting Programs indicate that a gradual increase in various types of research work for publication may be expected during 1944. Many industrial laboratories, Government bureaus, and individuals have data compiled on important research work studies, but the extreme pressure of wartime activities has prevented the assembling and writing of such material for publication.

This increase is slight at the present time; on this date (March 27, 1944), three more papers have been received than at the same time in 1943. The Division Programs, however, are filled to overflowing. The chart shows an increase of 17 titles over the number on the 1943 Program, but the totals fail to show the real gain in publication material.

Design Division

The Design Division has only 11 titles this year as compared with 21 titles in 1943; this Division, however, is in the midst of a reorganization program, and two full-time sessions are being used for business reports and a discussion of questionnaires. The officers deliberately tried to hold down the number of papers to be presented.

Enamel Division

The 1943 Program had only six papers scheduled; there were two sessions of panel discussions. The Program for 1944 has fourteen papers for four full-time sessions, and the Symposium on Tests and a Panel Discussion occupy only part of the time for the two sessions for which they are scheduled.

ENAMEL BIBLIOGRAPHY

All of the Enamel Bibliography is now in page proof. It totals 311 pages exclusive of the index. Page-proof reading has been completed on 60 pages. Index cards are being checked on the last 50 pages of the Bibliography. When this is finished the cards will be alphabetized and edited.

Glass Division

The Glass Division has held consistently to its normal number of titles; two concurrent sessions are scheduled for one-half day on "Optical Glass" and "Glass Furnace Operation."

Materials and Equipment Division

Eleven papers are listed for two half-day sessions; the members will join the White Wares Division for the Ball Clay Symposium and also for the program for Wednesday afternoon.

Refractories Division

An increase of seven titles for 1944 is encouraging for this Division.

Structural Clay Products Division

This Division for 1944 has approximately the same number of prepared papers as was given in 1943; two full sessions will be used for a Symposium on Postwar Considerations for the structural clay products industry.

White Wares Division

This Division shows the most marked increase in number of titles. In 1943, two full half-day sessions were given over to symposia, one of them being sponsored by the Materials and Equipment Division. Only 12 paper titles were listed. The 1944 Program shows 20 titles in addition to one-half day for Part III of the Ball Clay Symposium. Several other titles submitted for the Division were placed on other Division programs.

JOHN D. SULLIVAN, *Chairman*,
Battelle Memorial Institute, Columbus, Ohio

REPORT OF DESIGN DIVISION OFFICERS

During the last Annual Meeting, the Board of Trustees passed resolutions changing the name of the Art Division to the Division of Ceramic Design. President Bales also appointed a Committee chosen from the membership, whose function was designated. This Committee was to act as a liaison between the ceramic industries and the Division of Ceramic Design. The ultimate aim of The Society was to create a new interest for the Division, an interest catering more to industry and less to small art studios and craftsmen, as well as coordinating the efforts between technologists and designers. It was hoped, therefore, that this increased activity of the Design Division might attract more designers to the Division and, above all, a greater support of ceramic industry to the Division. After the successful fulfillment of these objectives, it was hoped that an Institute of Ceramic Design might be formed within The Society. This Institute was to function in a manner similar to the Institute of Ceramic Engineers.

On June 4, a letter by the newly elected Chairman of the Design Division, Walter A. Weldon, was mailed to all members.* This letter set forth the facts as stated. The response to this letter was very meager, although three or four replies were received commending the increased aims of the Division. Among these few letters was one written on June 20, in which it was recommended that a questionnaire be mailed to every ceramic plant of probable interest in this country, regardless of membership. This recommendation was accepted by the Chairman, Mr. Weldon, and also had the written endorsement of President Bales and Ralston Russell, Jr., Chairman of the Membership Committee.

As the headquarters at Columbus were very busy on other and perhaps more important matters, it was not until October 5 that we were able to mail the letter and questionnaire. From headquarters, we learned that these letters and questionnaires were mailed to 615 persons and companies. These are broken down as follows:

Pressed and Blown Glassware	109
Chinaware Potteries (vitrified)	26
Earthenware Potteries	43
Miscellaneous Whiteware Potteries	57
Glass Containers and Hollow Ware	50
Artware Potteries	135
Enameling Plants	37
Stoneware Potteries	52
Terra-Cotta Plants	18

The remaining letters and questionnaires were mailed to members of the Design and White Wares Divisions, a total of 527 ceramic plants and 88 individuals.

By January 1, 1944, we received 52 replies broken down as follows:

Glass Manufacturers	6
Whiteware Potteries	12
Artware Potteries	17
Schools of Art	3
Stoneware Plants	1
Unknown Classification	3
Personal Replies	2
Questionnaires returned with statement of no interest	8

A résumé of these replies indicated the following information: Twenty-four plants professed having or employing designers. Of these only eleven were known professional designers. Thirteen were owners of artware potteries and classed themselves as designers. Of the eleven professional designers who answered the questionnaire, six belonged to The Society, only three of which were noted as active Division members. Fourteen plants acknowledged having Design Departments.

A further examination of the replies indicated that ten designers or self-styled designers were good prospects for membership. Another eight persons, although not designers, might be induced to join The Society, making a

* See *Bull. Amer. Ceram. Soc.*, **22** [8] 271 (1943).

total of eighteen prospective new members. Of these, six corporations and nine members have since joined. No further attempts as yet have been made to induce the remaining prospects to join.

A number of outstanding organizations, which maintain either designers or Design Departments or both, *did not* respond.

Of particular significance are the replies received to questions 8 and 9, namely, "In what manner could the Design Division of The American Ceramic Society assist in promoting design and consumer acceptance of your product?"; "Give briefly any additional information which will help in building a program that will fill the needs of industry." The replies received in answer to these two question were interesting, but, with one or two limited exceptions, there seemed to be no outstanding general agreement.

From the replies, it has been noted that too many companies expect the Design Division to function as a trade or technical organization. For instance, we are asked to give data on colored glazes and clays, to give protection against copyists, to promote a campaign to sell American products, to invite design problems from industry which the designers in the Division should solve, to promote a designers' trade magazine, and to solve practical production problems.

Among the suggestions received, on which the Design Division could function, are the following:

(1) Devote more space to design in *The Bulletin*.

(2) Foster cooperation between manufacturers and art schools.

(3) Induce industrial designers to appear on Design Division programs.

(4) Foster exhibitions and awards.

(5) Induce American organizations such as the D.A.R. to use ware of American design.

(6) Provide interesting data from good American art potters, etc.

At least one of these objectives has been attained insofar as the Annual Meeting will attest. For instance, we had on our General Session program some leading industrial designers, viz., J. Gordon Lippincott of Dohner & Lippincott, I. W. Clark of the Westinghouse Electric & Manufacturing Company, and Douglas C. Carson of Steuben Glass, Inc. In our Division meetings, we had Vincent Broomhall of the Edwin M. Knowles China Company, Frederick Heath, Jr., of the Owens-Corning Fiberglas Corporation, Frederick R. Matson, an archeologist of Washington, D. C., and last but not least Don L. Hadley, Design Consultant with the Westinghouse Electric & Manufacturing Company. I hope the Board of Trustees will approve the other suggestions and take steps in fulfillment, so that the objectives may be attained in fact.

In summarizing, I want to call your attention particularly to the fact that we have too few professional designers in our Division. We must have more cooperative help from those ceramic organizations who do maintain Design Departments or employ designers. In other words, if the concerted effort of the Board of Trustees, the officers of The Society, the officers of the Divisions, and the Design Committee appointed by the Board will enable the Design Division to include among its membership *all* professional and some nonprofessional designers, provided these new members take an active part in the Division program, there is no doubt but that we could develop into the most active and vigorous Division in The Society. To accomplish this we *must* induce the leading ceramic industrialists and corporations that design *does* pay, and thus, having educated them to this fact, have them or their organizations give moral and financial support to our objectives.

—THEODORE LENCHNER, *Vice-Chairman*,
Vitro Manufacturing Company, Pittsburgh, Pa

STANDING COMMITTEES FOR 1944–1945

Executive Committee, Board of Trustees

E. H. FRITZ (*ex officio*): Stupakoff Ceramic & Mfg. Co., Latrobe, Pa.
C. E. BALES: Ironton Fire Brick Co., Ironton, Ohio
C. FORREST TEFFT: The Claycraft Co., Columbus, Ohio
J. E. EAGLE: War Production Board, Non-Metals Section, Washington, D. C.
H. M. KRANER: Bethlehem Steel Co., Bethlehem, Pa.

Finance Committee, Board of Trustees

C. FORREST TEFFT, *Chairman:* The Claycraft Co., Columbus, Ohio
J. D. SULLIVAN: Battelle Memorial Institute, Columbus, Ohio
J. B. AUSTIN: Research Lab., U. S. Steel Corp., Kearny, N. J.

Committee on Public Relations

V. V. KELSEY, *Chairman:* Dominion Minerals, Inc., Shoreham Bldg., Washington, D. C.
F. C. FLINT: Hazel-Atlas Glass Co., Washington, Pa.
H. M. KRANER: Bethlehem Steel Co., Bethlehem, Pa.
A. A. WELLS: Homer Laughlin China Co., Newell, W. Va.
J. E. EAGLE: War Production Board, Non-Metals Section, Washington, D. C.

Committee on Rules

W. KEITH MCAFEE, *Chairman:* Universal Sanitary Mfg. Co., New Castle, Pa. (assisted by the Chairman of the Rules Committee of each Class and Division)

Committee on Publications

R. L. STONE, *Chairman:* Univ. of North Carolina, Raleigh Unit, Raleigh, N. C.
HARRY THIEMECKE: Homer Laughlin China Co., Newell W. Va.
R. E. BIRCH: Harbison-Walker Refractories Co., Pittsburgh, Pa.
H. ZANE SCHOFIELD: Battelle Memorial Institute, Columbus, Ohio.
R. C. PURDY (*ex officio*): The American Ceramic Society, Inc., Columbus, Ohio.

Committee on Membership

RALSTON RUSSELL, JR., *Chairman:* Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. (assisted by Chairman of the Membership Committee of each Class and Division, as follows:)
W. A. WELDON: Locke Insulator Corp., Baltimore, Md. (Design Division)
J. F. HUNT: Orefraction, Inc., Pittsburgh, Pa. (Enamel Division)
F. V. TOOLEY: Owens-Corning Fiberglas Corp., Newark, Ohio (Glass Division)
V. V. KELSEY: Dominion Minerals, Inc., Shoreham Bldg., Washington, D. C. (Materials and Equipment Division)
L. C. HEWITT: Laclede-Christy Clay Products Co., St. Louis, Mo. (Refractories Division)
C. FORREST TEFFT: The Claycraft Co., Columbus, Ohio (Structural Clay Products Division)
A. A. WELLS: Homer Laughlin China Co., Newell, W. Va (White Wares Division)
A. S. WATTS, Ohio State University, Columbus, Ohio (Institute of Ceramic Engineers)
D. G. BENNETT, Univ. of Illinois, Urbana, Ill. (Ceramic Educational Council)

Committee on Standards

J. W. WHITTEMORE, *Chairman:* Virginia Polytechnic Institute, Blacksburg, Va. (assisted by members of the Standards Committee of each Class and Division)

Committee on Sections and Divisions

C. C. TREISCHEL, *Chairman:* R. T. Vanderbilt Co., New York, N. Y.
E. W. EMRICH: R. T. Vanderbilt Co., Norwalk, Conn.
A. LEE BENNETT: Gladding, McBean & Co., Seattle, Wash.
(Committee assisted by Chairman of each Division and Section)

Committee on Research

A. A. WELLS, *Chairman:* Homer Laughlin China Co., Newell, W. Va. (assisted by a member from each Division)

Committee on Geological Surveys

H. RIES, *Chairman:* 401 Thurston Ave., Ithaca, N. Y.
J. E. LAMAR: State Geology Div., Univ. of Illinois, Urbana, Ill.
O. C. RALSTON: Non-Metals Div., U. S. Bureau of Mines, Washington, D. C.
F. K. PENCE: Univ. of Texas, Div. of Industrial Chemistry, Austin, Tex.
HEWITT WILSON: Electrotechnical Lab., U. S. Bureau of Mines, Norris, Tenn.
NORMAN PLUMMER: State Geological Survey of Kansas, Lawrence, Kans.
A. F. GREAVES-WALKER: Office of Production Research & Development, War Production Board, Washington, D. C.

Committee on Classification and Nomenclature

M. F. BEECHER, *Chairman*: Norton Co., Worcester, Mass. (assisted by Class and Division representatives)

Committee on Ceramic Education

J. S. GREGORIUS, *Chairman:* Pittsburgh Plate Glass Co., Creighton, Pa. (Technology Member, 1 year)
ALICE A. AYARS: 12479 Cedar Rd., Cleveland Heights, Ohio (Art Member, 2 years)
H. M. KRANER: Bethlehem Steel Co., Bethlehem, Pa. (Engineering Member, 3 years)
R. M. KING: Ohio State University, Columbus, Ohio (Education Member, 4 years)
J. W. HEPPLEWHITE: Edwin M. Knowles China Co., Newell, W. Va. (Industry Member, 5 years)

Committee on Industrial Management

C. E. BALES, *Chairman:* Ironton Fire Brick Co., Ironton, Ohio (assisted by a member from each Division)

Committee on Patents

F. B. FLICK, *Chairman:* 1706 First National Bank Bldg., Pittsburgh, Pa.
C. F. GEIGER: Carborundum Co., Perth Amboy, N. J.
R. E. BIRCH: Harbison-Walker Refractories Co., Pittsburgh, Pa.

Committee on Film Library

H. E. SIMPSON, *Chairman*: Mellon Institute, Pittsburgh, Pa.
J. W. JORDAN: Mellon Institute, Pittsburgh, Pa.
R. C. PURDY: The American Ceramic Society, Inc., Columbus, Ohio

Committee on Air Hygiene

F. A. HARVEY, *Chairman:* Harbison-Walker Refractories Co., Pittsburgh, Pa.
F. C. FLINT: Hazel-Atlas Glass Co., Washington, Pa.
EDWARD SCHRAMM: Onondaga Pottery Co., Syracuse, N. Y.
V. P. AHEARN: National Industrial Sand Association, Washington, D. C.
L. H. MILLIGAN: Norton Co., Worcester, Mass.

Committee for the Design Division

W. A. WELDON, *Chairman:* Locke Insulator Corp., Baltimore, Md.
W. KEITH MCAFEE: Universal Sanitary Mfg. Co., New Castle, Pa.
V. V. KELSEY: Dominion Minerals, Inc., Shoreham Bldg., Washington, D. C.
F. C. FLINT: Hazel-Atlas Glass Co., Washington, Pa.
A. A. WELLS: Homer Laughlin China Co,, Newell, W. Va.
R. A. WEAVER: Ferro Enamel Corp., Cleveland, Ohio
R. E. JORDAN: Mosaic Tile Co., Matawan, N. J.

APPOINTED REPRESENTATIVES FOR 1944–1945

American Association for the Advancement of Science

R. C. PURDY: The American Ceramic Society, Inc., Columbus, Ohio

American Foundrymen's Association

Joint Committee on Foundry Refractories: L. C. HEWITT, Laclede-Christy Clay Products Co., St. Louis, Mo.
G. A. BOLE: Engineering Experiment Station, Ohio State University, Columbus, Ohio
J. L. LOWE, Battelle Memorial Institute, Columbus, Ohio
Research Committee on Foundry Sand: H. M. KRANER, Bethlehem Steel Co., Bethlehem, Pa.

American Society for Testing Materials

Committee A–1 on Steel: H. F. STALEY, Metal & Thermit Corp., 120 Broadway, New York, N. Y.
Committee C–4 on Clay Pipe: C. M. DODD, Iowa State College, Ames, Iowa
Committee C–5 on Fire Tests of Materials and Construction: J. L. CARRUTHERS, Ohio State Univ., Columbus, Ohio
Committee C–6 on Drain Tile: J. L. CHILD, Hancock Brick & Tile Co., Findlay, Ohio
Committee C–7 on Lime: C. R. AUSTIN, Battelle Memorial Institute, Columbus, Ohio
Committee C–8 on Refractories: J. W. WHITTEMORE, Virginia Polytechnic Institute, Blacksburg, Va.
Committee C–11 on Gypsum: H. E. SIMPSON, Mellon Institute, Pittsburgh, Pa.
Committee C–14 on Glass and Glass Products: G. W. MOREY, Geophysical Laboratory, Washington, D. C.
Committee C–15 on Manufactured Masonry Units: J. W. WHITTEMORE, Virginia Polytechnic Institute, Blacksburg, Va.
Committee D–3 on Gaseous Fuels: A. W. GAUGER, Pennsylvania State College, State College, Pa.
Committee D–5 on Coal and Coke: A. W. GAUGER.
Committee D–9 on Electrical Insulating Materials: L. E. BARRINGER, General Electric Co., Schenectady, N. Y.

American Society of Mechanical Engineers

Petroleum Division: H. R. STRAIGHT, Straight Engineering Co., Adel, Iowa.
Process Division: W. KEITH MCAFEE, Universal Sanitary Mfg. Co., New Castle, Pa.

American Standards Association

Sectional Committee on Specifications for Drain Tile (Project A–6): J. L. CHILD, Hancock Brick & Tile Co., Findlay, Ohio

Sectional Committee on Minimum Requirements for Plumbing and Standardization of Plumbing Equipment (Project A–40): HARRY WHITTAKER, Crane Co., Chicago, Ill.

Sectional Committee on Recommended Practice for Brick Masonry (Project A–41): J. W. WHITTEMORE, Virginia Polytechnic Institute, Blacksburg, Va.

Sectional Committee on Coordination of Dimensions of Building Materials and Equipment (Project A–62): FREDERICK HEATH, JR., Owens-Corning Fiberglas Corp., Toledo, Ohio

Sectional Committee on Insulators for Electric Power Lines (Project C–29): G. W. LAPP, Lapp Insulator Co., Le Roy, N. Y.

Sectional Committee on Scientific and Engineering Symbols and Abbreviations (Project Z–10): RALSTON RUSSELL, JR., Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

Sectional Committee on Specifications for Sieves for Testing Purposes (Project Z–23): A. S. WATTS, Ohio State University, Columbus, Ohio

Sectional Committee on Specifications and Methods of Test for Safety Glass (Project Z–26): GEORGE WATKINS, Libbey-Owens-Ford Glass Co., Toledo, Ohio; D. E. SHARP, Libbey-Owens-Ford Glass Co., Toledo, Ohio (alternate)

International Association for Testing Materials

S. M. PHELPS: Mellon Institute, Pittsburgh, Pa.

International Commission on Glass Technology

J. C. HOSTETTER: Mississippi Glass Co., St. Louis, Mo.

International Chemical Congress

ALEXANDER SILVERMAN: University of Pittsburgh, Pittsburgh, Pa.

Inter-Society Color Council

I. A. BALINKIN, *Chairman:* University of Cincinnati, Cincinnati, Ohio

H. D. CALLAHAN: U. S. Quarry Tile Co., East Sparta Ohio

W. E. DOUGHERTY: O. Hommel Co., Pittsburgh, Pa.

R. S. HUNTER: National Bureau of Standards, Washington, D. C.

N. J. KREIDL: Bausch & Lomb Optical Co., Rochester, N. Y.

L. H. MILLIGAN: Norton Co., Worcester, Mass.

V. H. REMINGTON: B. F. Drakenfeld & Co., Inc., Washington, Pa.

CAMPBELL ROBERTSON: E. I. du Pont de Nemours & Co., Inc., Perth Amboy, N. J.

EDWARD SCHRAMM: Onondaga Pottery Co., Syracuse, N. Y.

A. S. WATTS: Ohio State University, Columbus, Ohio

WOLDEMAR WEYL: Pennsylvania State College, State College, Pa.

Illuminating Engineering Society and Luminous Glassware Guild

H. H. BLAU, *Chairman:* Federal Glass Co., Columbus, Ohio

R. A. MILLER: Pittsburgh Plate Glass Co., Pittsburgh, Pa.

R. R. SHIVELY: B. F. Drakenfeld & Co., Inc., Washington, Pa.

National Research Council

Division of Geology and Geography: G. W. MOREY, Geophysical Laboratory, Washington, D. C.

Division of Chemistry and Chemical Technology: G. W. MOREY

Orton Foundation Board

L. E. BARRINGER: General Electric Co., Schenectady, N. Y.

United States Department of Commerce, Division of Simplified Practice; Permanent Committee on Simplification of Variety and Standards of Vitrified Paving Brick

C. C. BLAIR: Metropolitan Paving Brick Co., Canton, Ohio

OUR MEMBERSHIP TURNOVER

	1936	1937	1938	1939	1940	1941	1942	1943
NEW MEMBERS								
Personal	122	200	166	147	146	194	193	189
Corporation	13	30	13	29	27	14	25	47
Student	55	61	91	95	106	80	100	71
	190	291	270	271	279	288	318	307
RESIGNATIONS								
Personal	22	54	67	87	70	68	95	64
Corporation	1	5	10	9	5	9	7	7
Student	0	1	1	8	3	7	2	2
	23	60	78	104	78	84	104	73
CUTOFFS								
Personal	76	40	46	47	27	53	58	89
Corporation	2	5	2	1	1	3	5	4
Student								
	78	45	48	48	28	56	63	93
Total Resignations and Cutoffs	101	105	126	152	106	140	167	166
Gain	89	186	144	119	173	148	151	141

Forty-Sixth Annual Meeting Registered Attendance

Members	872
Nonmembers	263
Ladies	110
Students	45
Total	1290

Those Handsome Glass Medallion Meeting Badges,

Gifts from the Imperial Glass Corporation By Carl J. Uhrmann, Won Unanimous Appreciation

OUR FINANCIAL HISTORY

Year	Personal	Corporation	Advertising	Subscriptions	Printing	Invested reserve	Salaries	Surplus
1927	$15,976.87	$6,876.87	$15,062.96	$1,693.00	$16,134.37	$ 9,861.00	$13,786.65	$12,437.43
1928	16,179.90	6,515.55	14,511.17	3,969.81	18,181.80	9,861.00	13,908.62	8,507.89
1929	16,912.40	6,422.71	14,146.95	4,771.78	20,374.76	10,280.02	13,769.30	9,734.68
1930	17,287.89	5,951.35	15,077.16	4,030.39	22,676.95	10,719.84	14,759.75	4,750.37
1931	19,266.22	5,650.28	10,856.37	4,382.04	19,658.53	11,175.79	13,905 00	6,828.40
1932	16,455.62	4,672.91	7,929.78	4,401.20	13,570.30	10,279.44	12,313.25	7,316.44
1933	11,650.95	3,786.73	6,522.82	3,657.87	13,175.69	8,162.79	11,420.01	5,066.57
1934	11,849.76	4,093.30	7,424.95	3,260.15	12,475.81	4,610.40	12,598.13	2,008.54
1935	16,145.30	4,678.93	8,506.71	5,163.00	16,181.35	3,176.31	13,120.76	2,248.76
1936	17,325.02	5,001.78	10,932.33	4,356.26	15,646.82	2,501.76	15,372.29	1,920.12
1937	19,655.22	5,624.49	10,816.61	5,163.00	16,181.35	7,864.26	16,837.50	2,833.44
1938	20,547.40	5,462.50	12,080.97	5,685.89	19,897.79	7,958.16	17,191.50	3,638.82
1939	20,950.32	5,912.16	12,824.80	6,188.82	20,455.29	11,861.16	17,553.25	7,205.26
1940	21,823.71	6,397.70	13,861.29	5,629.95	20,941.20	12,119.16	17,940.00	10,789.42
1941	22,514.83	6,424.97	13,820.33	5,714.25	20,664.68	21,417.16	18,547.25	15,266.19
1942	23,073.13	6,723.58	13,528.69	3,529.79	19,604.15	21,715.16	20,422.00	15,645.31
1943	23,934.78	7,725.12	14,528.45	4,570.25	20,120.12	30,013.16	19,437.10	23,250.41

LOCAL SECTIONS

UPSTATE NEW YORK SECTION

The first meeting of the Upstate New York Section of The American Ceramic Society was held March 24, 1944, at the Stuyvesant Hotel in Buffalo with about one hundred members in attendance.

After dinner, Temporary Chairman M. H. Berns called for a report from the Nominating Committee consisting of R. E. Gould, H. R. Lillie, and Howard Failmezger. The nominees then duly elected by unanimous vote were as follows:

Councillor: M. E. Holmes, Dean, New York State College of Ceramics, Alfred, N. Y.
Chairman: Milton H. Berns, Research Director, Electro Refractories & Alloys Corp., Buffalo, N. Y.
Secretary-Treasurer: Edward E. Kunzman, Superintendent, Refractories Division, Titanium Alloy Mfg. Co., Niagara Falls, N. Y.

Cecil E. Bales, president of The American Ceramic Society, presented the Local Section with its charter upon which were inscribed the names of The Society members who had met in January and requested the charter. He then commented briefly on the fine spirit prevailing at the present meeting and complimented the members on the fine representation.

A series of fundamental by-laws was adopted by the members.

A resolution was presented and adopted to the effect that the Local Section issue an invitation to The American Ceramic Society to hold its 1945 Annual Meeting in Buffalo.

S. F. Walton, president of the New York Ceramic Association, extended an invitation to meet with them at their fall conference.

Ross C. Purdy offered greetings and invited all present to attend the Pittsburgh Meeting. He also extended praise to Cecil Bales for his work as president of The Society.

The speaker of the evening, Dr. Hillier of the RCA Laboratories, was then introduced and gave an illustrative and entertaining talk on "The Development of the Electron Microscope and Its Possible Applications to the Ceramic Industries." Tracing the development of this instrument from its forerunner, the light microscope, Dr. Hillier elaborated on the latest innovations and experimentations with the most modern versions of electronic equipment.

The next meeting will be held May 26, 1944, at Corning, N. Y., with H. R. Lillie of the Corning Glass Works in charge of arrangements.

—E. E. Kunzman, *Secretary*

BALTIMORE-WASHINGTON SECTION

The spring meeting of the Baltimore-Washington Section of The American Ceramic Society was held at The Highlands in Washington, D. C., March 11, 1944. Seventy-one members and guests attended.

Following the roast chicken dinner, Chairman D. G. Moore called the meeting to order. The Nominating Committee, consisting of R. F. Geller, *Chairman*, A. S. Creamer, and L. A. Messimer, all of the National Bureau of Standards, presented nominations for officers for the 1944–1945 season, which were unanimously approved.

The new officers are as follows:

Councillor: D. G. Moore, National Bureau of Standards, Washington, D. C.
Chairman: W. R. Lester, Maryland Glass Co., Baltimore, Md.
Vice-Chairman: J. C. Richmond, National Bureau of Standards, Washington, D. C.
Secretary-Treasurer: J. H. Veale, General Refractories Co., Baltimore, Md.

Charles S. Pearce, managing director of the Porcelain Enamel Institute, Washington, D. C., presented the first paper on the program entitled "Postwar Prospects for Porcelain Enameling." He gave a rosy picture of the postwar prospects for porcelain enameling, with particularly bright prospects in the home appliance field. Some plants expect to be able to reconvert to civilian production within two weeks after they have completed their war contracts.

The second paper, "Recent Developments in the Field of Plastics," was presented by Frank Reinhart, of the Organic Plastics Section of the National Bureau of Standards. Although there are many plastic materials, some of which are used in ceramics (clays, for instance), the materials covered by the plastics industry, and known as plastics by the general public, are defined as organic materials which are not highly extensible and which can be molded under heat and pressure. Many plastics exhibit a wide range of properties. Where their properties are suitable, plastics do a good job, but they are definitely not a cure-all. A brief survey of the development of plastics and the properties of the various types was presented. A large variety of articles made from plastics was exhibited, including a plastic canteen (quite serviceable but makes the water taste bad); a bugle; a mouth organ made completely of plastic, including the reeds, by assembling five separate moldings; an artificial leather used for shoe soles; binocular cases for the Navy; flashings in brick walls, etc.; screening of three different types; a light expanded plastic used as a buoyant material or an

insulator; and coffee cups for use on airplanes (made a special color so they will not show coffee stains).

Mr. Reinhart emphasized the fact that there should be little competition between plastics and ceramics, because each has its place. Production of plastics is still measured in pounds rather than in tons. Practically all plastics are molded, and mold costs are high, so objects made from plastics must be produced in large numbers to keep costs down.

The final talk on the program was by Walter A. Weldon, of the Locke Insulator Corp., Baltimore, Md. Mr. Weldon showed specimens of cooking ware made at the Locke Insulator Corporation from insulator bodies by casting, jiggering, and dry-press methods.

Because most insulator plants are operated more or less as jobbing plants, manufacturing insulators on order and maintaining small inventories, their outputs have varied and frequent layoffs have been common. By filling in between insulator orders with ware of this type made with the same bodies, forming methods, glazes, and firing methods used for insulators, employment in insulator plants can be leveled out with benefits to both management and labor. There is a real market for this type of ware at this time because of the lack of imports from Europe and Japan, and Mr. Weldon believes that this market can be retained and further developed after the war by proper promotion and marketing.

—J. C. RICHMOND, *Secretary*

CERAMIC SOCIETY OF THE SOUTHWEST

The fourth program meeting of the Ceramic Society of the Southwest was held at Mineral Wells, Texas, March 17 and 18, 1944.

Upon arrival at the Baker Hotel, the members were greeted by the local Entertainment Committee headed by the popular Bob Brewer, of the Mineral Wells Clay Products Company.

The afternoon of March 17 was given over to plant visitation. At the Bennett plant of the Acme Brick Company, the operation of a shale planer was made the background for a photograph of a group of the members. The Pennsylvania shale formation is used in the manufacture of face brick, roofing tile, quarry tile, and a line of hollow building tile. Two other plants at Mineral Wells operating on the same shale strata were visited, viz., the Mineral Wells Clay Products Company and the Reliance Clay Products Company. The fact that each of the three plants visited happened to be extruding a different type of product added to the interest of the visits.

Saturday forenoon, papers were presented on subjects pertaining to the handling of raw material and forming of the ware, as follows:

(1) "Quarrying" by FRANK MAHURIN, Alamo Clay Products Co., Elmendorf, Texas.

(2) "Die Balance" by LESTER STACKS, Elgin Standard Brick Mfg. Co., Elgin, Texas.

(3) "Auger Machines" by E. H. GATLIN, Acme Brick Co., Pearla Plant, Malvern, Ark.

All of these papers were followed by an avalanche of questions and discussion that resulted in valuable exchanges of information. In the afternoon session, the first order of business was the election of officers, which resulted as follows:

President: FRANK MAHURIN, Alamo Clay Products Co., Elmendorf, Texas.

Vice-President: T. J. ORRINDER, Garrison Brick & Tile Co., Garrison, Texas.

Secretary-Treasurer: F. K. PENCE, Ceramic Division, University of Texas, Austin, Texas.

Executive Committee: RAY PAFFORD, Acme Brick Co., Ft. Worth, Texas, and RUDY NORDMEYER, Valley Brick & Tile Co., Mission, Texas.

Following the business session, additional papers were presented as follows:

(4) "Grain Sizes" by HARRY BROWN, Seguin Brick & Tile Co., McQueeney, Texas.

(5) "Report on Clay Studies" by F. K. PENCE, Ceramic Division, University of Texas, Austin, Texas.

After a general discussion, the Society adjourned to meet at the University of Texas next October. It should be noted that each program meeting has shown an increase in interest and attendance, and in spite of existing handicaps, the Mineral Wells meeting broke all previous records.

—F. K. PENCE, *Secretary*

GLASS SCIENCE, INCORPORATED
ANNOUNCEMENT MADE BY FRANK L. JONES AT APRIL MEETING OF GLASS DIVISION OF AMERICAN CERAMIC SOCIETY

The Glass Division of The American Ceramic Society is the central organization that draws into one group all of those interested in glass. It includes persons engaged in practical manufacturing enterprises as well as scientists. It is proper, therefore, that when a group of practical men in the glass industry unite to support fundamental scientific research, the Glass Division should be informed of the group's activities and plans. The companies that have so far obligated themselves to support such fundamental research on glass are the American Optical Company, the Bausch & Lomb Optical Company, the Eastman Kodak Company, and the Pittsburgh Plate Glass Company. The project has been formally organized under the name of Glass Science, Inc. The impetus to form Glass Science was furnished by W. A. Weyl.

I first heard of Dr. Weyl's idea for the organization of industrial support for pure research at the Sky Top Meeting of the Glass Division in 1940. He told of his work with the Czechoslovakian Glass Institute and spoke enthusiastically of the possibilities of such an organization in the United States. Although the desirability of having such research carried on in America was repeatedly voiced by leading men in The Society, it was by no means certain that the necessary financial support could be obtained for this type of project. Encouraged by the example of the support given by the food industry to the Nutrition Foundation, in January, 1943, Dr. Weyl took active steps to interest industrial sponsors in supporting fundamental glass research. Dr. Weyl first approached the companies most likely to be desirous of seeing his work on the relation between glass structure and optical properties continued on an adequate basis.

The incorporation of Glass Science took place December 16, 1943. Dr. Weyl is research director of the Corporation and, as such, responsible to the Research Committee which held its first meeting January 28, 1944. Glass Science is independent of any educational institution, but for the duration of the war has rented space from the Pennsylvania State College, State College, Pa., where Dr. Weyl is professor of glass technology. A permanent location will be selected after the war.

The greater percentage of research initiated and sponsored by Glass Science is scattered in different universities in various parts of the United States. A special effort has been made to encourage scientists who are specialists in fields not now connected with glass research to use their newest techniques and methods to discover more about the structure and properties of glass. Several of the original projects are related to the optical properties of glass. Fundamental research, however, will be encouraged and

supported for the glass industry generally if the project grows.

Results of research will be published. It is not the purpose of Glass Science to own or acquire patent rights except as reasonably incidental to its main research activities. If such rights are acquired and held, Glass Science will grant nonexclusive licenses to all applicants and the income therefrom will be used to further additional fundamental research.

The Corporation intends at this stage of its development to elect as sustaining members on the same basis as its present members such companies as indicate a desire to join and who have a real interest in the kind of research which it has undertaken. The by-laws provide also for a class of subscribing members. These will normally be smaller companies elected for yearly terms and presumably interested in only certain phases of the Corporation's research program.

Provision is also made in the by-laws for associate membership to permit the participation, on a noncontributing basis, of persons not connected with glass industrial enterprises but who are interested in the purposes of Glass Science and are in a position to assist in its work.

The officers of the Corporation at present are as follows:

Board of Directors:

CARL L. BAUSCH, Bausch & Lomb Optical Co., Rochester, N. Y.
ROBERT L. CLAUSE, Pittsburgh Plate Glass Co., Pittsburgh, Pa.
C. E. KENNETH MEES, Eastman Kodak Co., Rochester, N. Y.
GEORGE B. WELLS, American Optical Co., Southbridge, Mass.

President: GEORGE B. WELLS, American Optical Co., Southbridge, Mass.
Vice-President: FRANK L. JONES, Bausch & Lomb Optical Co., Rochester, N. Y.
Secretary: ROBERT L. CLAUSE, Pittsburgh Plate Glass Co., Pittsburgh, Pa.
Treasurer: G. E. BASKIE, American Optical Co., Southbridge, Mass.
Research Director: W. A. WEYL, Pennsylvania State College, State College, Pa.

Any person interested in this project can obtain further information by writing to

Glass Science, Inc.,
c/o The Pennsylvania State College,
State College, Pa.

SILVERMAN DISCUSSION

At the luncheon of the Glass Division of The American Ceramic Society one year ago, I proposed the establishing of a Glass Foundation.* It is gratifying to see that Glass Science, Inc., has come into being within the year, and it has my congratulations and best wishes. It is especially encouraging that this plan was initiated by optical glass interests and producers of glass for scientific use. It is in these branches that pure research in glass had its beginnings.

In a sense I regret the title, "Glass Science, Incorporated," for with the broader title of "The Glass Foundation" an organization could have considered art as well as science and even entered the field of economics, for varied research wants to be done in connection with postwar problems. However, the old saying, "A rose by any other name is just as sweet," may apply here.

I urge the entire glass industry of America fully to support Glass Science, Inc. In recent years, there has been an occasional tendency to establish a number of organizations in a single field. Here the saying, "A house divided against itself must fall," should be given serious thought. Instead of Glass Science, Inc., and a number of other independent glass institutions, we should, if possible, foster and support one central research organization. The interests of a particular group of manufacturers should be secondary. The interests of the glass industry as a whole are paramount.

Finally, a thought regarding the policy of Glass Science, Inc. It has come to my attention that although research grants have already been made to educational institutions, no grants are available for post-doctorate fellowships. According to present Selective Service rules, occupational deferment is only granted to individuals who devote themselves fully to essential control work in war industries, to research on war problems, or to teaching. This means that pure research fellows will be placed in Class 1-A. Making fellowship grants to post-doctorate fellows would have the advantage that the talent of individuals beyond draft age could be utilized. Of course, women who are candidates for Masters' or Doctors' degrees would still be available, but there are also post-doctorate scholars, men and women, whose services should be utilized for pure research. I hope that post-doctorate fellowships will be established.

—ALEXANDER SILVERMAN,
Department of Chemistry,
University of Pittsburgh,
Pittsburgh, Pa.

* See *Bull. Amer. Ceram. Soc.*, 22 [8] 299–300 (1943).

APPRECIATION OF ANNUAL MEETING

April 10, 1944

Gentlemen:

Since attending the Meeting, I have decided to list my entire interest in The Society under the Design Division and also to pass along a few remarks as to why.

I got around quite a bit while I was in Pittsburgh but I seemed to get more inspiration and to find more people looking forward in the little Design Division than in all of the other groups put together. I was somewhat a stranger in your midst, being an amateur potter who expects soon to open a small pottery. Not being interested in any one thing, I was able to see the picture as a whole. I don't think you will be flattered when I tell you I think that the tail is wagging the dog.

It just so happens that during the war the dinnerware people can sell anything that will hold "wittles." The time will come when competition will again rear its threatening head. Then, just as sure as fate, you are going to stampede the designers for something new.

I listened to the report of Mr. Weldon and of the work that he is doing with the Public Relations Committee. When I realized the small support and attention that is being given this little group, I certainly wondered if the ceramic industry was wide awake.

Did it ever occur to the dinnerware people that the cups, saucers, and plates they are making are of a design established centuries ago? Isn't it pretty nearly time that someone got out a new set of dishes completely different in functional design, and to go along with them, invent a new name to take the place of "dishes"?

I do wish to complement you personally on one thing—the Meeting was one of the smoothest-operating affairs I ever attended. I did come away with this idea—the ceramic industry of America seems to be 100% in the hands of real Americans. I enjoyed myself immensely and am sorry I didn't arrange to stay three days. I am going to go to Buffalo next year and plan to remain through all the sessions.

Very truly yours,

FRED P. PEEL, *Ordnance Engineer,*
Clayton & Lambert Mfg. Co., Detroit, Mich.

Join the Design Division

of

THE AMERICAN CERAMIC SOCIETY

TAKE AN ACTIVE PART IN THE MEMBERSHIP INTERESTED IN THE MODERN DESIGN OF ALL CERAMIC PRODUCTS FROM DINNERWARE TO BUILDINGS.

OHIO VALLEY AND ATLANTIC COAST STATES SECTIONS NOW FORMING.

MANY OF THE NATION'S LEADING DESIGNERS ARE MEMBERS OF THIS PROGRESSIVE DIVISION.

Encourage Your Designer to Join!

BETTER DESIGN FOR BETTER LIVING GROW WITH AMERICA!

Walter A. Weldon, *Chairman*, Baltimore, Md.
Theodore Lenchner, *Vice-Chairman*, Pittsburgh, Pa.

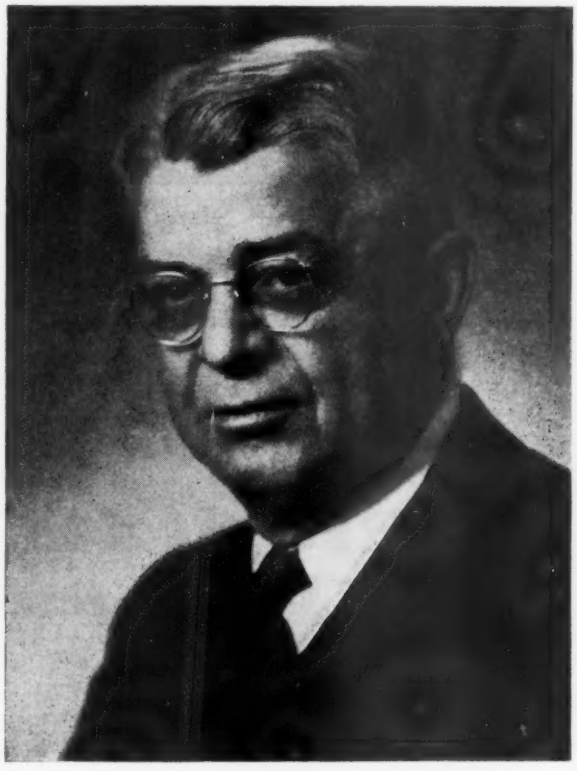
SALUTE TO A FAITHFUL AND HONORED MEMBER

BURTON T. SWEELY

One of the most active members of The American Ceramic Society is Burton T. Sweely, a Charter Fellow and member since 1916.

Mr. Sweely has been particularly active in the Enamel Division, having served as chairman, 1922–1923, Trustee, 1928–1930, and as a member of the Committee on Standardization of Products, 1922–1924; Special Committee on Enameling Furnaces for Sheet Metal Ware (chairman), 1923–1924; Nominating Committee, 1923–1924, 1927–1928, 1932–1933, 1934–1935, 1938–1939, and 1940–1941; and Committee on Research, 1930–1933. He also served on The Society Committee on Membership (Enamel representative) in 1921–1922 and on the Special Committee on Conference of Makers and Users of Scientific Apparatus in 1923–1924.

He is a member of the Founder's Group of the Institute of Ceramic Engineers.



Burton T. Sweely

Biography

Burton T. Sweely was born May 31, 1886, in Mitchell, S. Dak. He attended the rural district schools of Iowa and took his college preparatory work at Memorial University, Mason City, Iowa. After attending Drake University, Des Moines, Iowa, for one year, he transferred in 1911 to Iowa State College, Ames, Iowa, where, after having dropped out of school for one year (1913–1914), he obtained his B.S. degree in ceramics in 1917.

For six months after graduation, Mr. Sweely was associated with the What Cheer Clay Products Co., What Cheer, Iowa, and in December, 1917, he entered the employ of the Western Electric Co., Chicago, Ill., as research ceramic engineer in the Hawthorne Works. In 1920, he joined the Coonley Mfg. Co., Cicero, Ill., as ceramic engineer in charge of enamel manufacture, later becoming superintendent of the Enameling Department. In 1922, he joined the staff of the Baltimore Enamel & Novelty Co., Baltimore, Md., as general factory manager, a position he held until 1932.

In 1932, Mr. Sweely became associated with the Chicago Vitreous Enamel Product Co., Cicero, Ill., as director of research and manager of frit production. He held this position until April 19, 1944, when he was elected vice-president in charge of research.

He is a member of Tau Beta Pi, the Masons, Sigma Alpha Epsilon fraternity, and an honorary member of Keramos (elected by the University of Illinois chapter).

In April, 1915, he married Vera C. Warner of Fairmont, Minn. Two children comprise his family, Belle (born in 1916) and Donald (born in 1918). The latter has been making an enviable record as a captain in the U. S. Army Air Corps.

Publications

(1) "Composition of Arsenic Enamels for Copper," *Jour. Amer. Ceram. Soc.*, **4** [5] 350–56 (1921).

(2) "Acid Resistance of Enameled Cooking Utensils," *ibid.*, 407–12.

(3) "Discussion on 'Microscopic Study of Ground-Coat and Cover-Coat Enamel Reactions,'" *Bull. Amer. Ceram. Soc.*, **1** [3] 112–13 (1922).

(4) "Relation of Composition to Thermal Shock in Steel Enamels," *Jour. Amer. Ceram. Soc.*, **5** [5] 263–65 (1922).

(5) "Fish-Scaling of Ground-Coat Enamels," *ibid.*, [9] 618–22.

(6) (With E. S. Prince) "Relation of Fineness of Grinding to Opacity in White Enamels," *ibid.*, [12] 855–57.

(7) (With R. R. Danielson) "Relation Between Composition and Properties of Enamels for Sheet Steel," *ibid.*, **6** [10] 1011–29 (1923); *Sprechsaal*, **59**, 80–81; *Chem. Zentr.*, **1926, I,** 2236.

(8) "Best Type of Furnace for Enameling Plants," *Ceram. Ind.*, **3**, 34 (1924).

(9) (With R. R. Fusselbaugh) "Method of Control of Enamel for Dipping Flatware," *Jour. Amer. Ceram. Soc.*, **8** [5] 303–306 (1925).

(10) "Practical Chemical Control of Pickling Room Solutions," *ibid.*, **9** [9] 590–92 (1926).

(11) (With E. P. Poste, G. L. Clark, A. I. Andrews, and M. Manson) "Practical and Technical Problems in Enameling," *Ceram. Ind.*, **22** [2] 76–78 (1934).

(12) "Improvements in Vitreous Enameling," *Metal Cleaning & Finishing*, **8** [1] 37–39 (1936).

(13) "Design and Factors Affecting Hairlining," *Proc. Porcelain Enamel Inst. Forum, First Forum, May, 1937*, pp. 46–53.

(14) "Pickling of Hollow Ware, I," *ibid.*, pp. 145–48; II, *ibid., Second Forum, Oct., 1937*, pp. 90–101.

(15) "Future of Enameling," *Bull. Amer. Ceram. Soc.*, **22** [7] 280–82 (1943).

(16) (With Wayne Duval) "Reduction in Postwar Enameling Costs, I–II," *Better Enameling*, **15** [2] 5–6, 20; [3] 5–6 (1944).

Patent

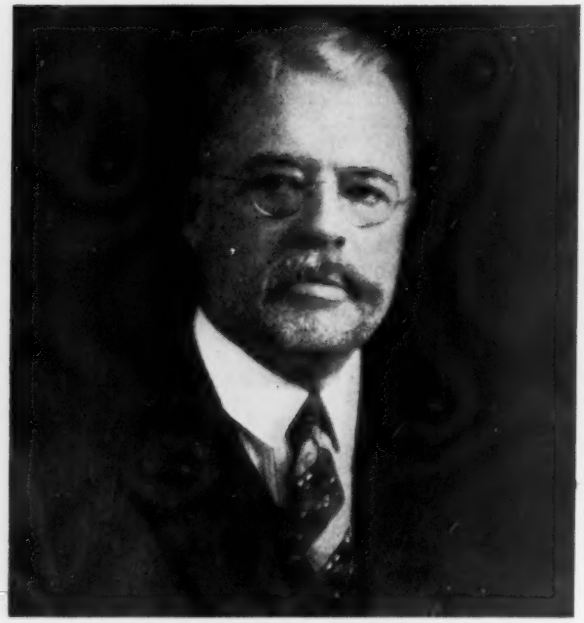
(With H. T. Bellamy) "Glass," U. S. 1,415,980, May 16, 1922.

NECROLOGY

GEORGE SHEPPARD BACON*

George Sheppard Bacon, retired general superintendent of the Armstrong Cork Company glass-container manufacturing plant at Millville, N. J., and one of the most widely known men in the glass industry, died at his home in Millville March 9, 1944, after suffering a slight stroke of paralysis a few days previously.

The outstanding ability of George Bacon was readily recognized as was his sound judgment and logic by his fellow manufacturers and all others who were interested particularly in the glass-container division of the glass-manufacturing industry. It is only in rare instances when a man has the opportunity of serving an industry for close to three score of years. Those who have enjoyed the privilege, particularly when they have constantly aided that industry as he did, in developing from the primitive method of manufacture to the highest standard of efficiency the industry now enjoys, must realize the great pleasure afforded Mr. Bacon when making a retrospect of his valuable contribution to the industry he so faithfully and untiringly served. He was a man of dignity, of few but well-chosen words, and his application of the Golden Rule in his endeavors proves that the adoption of its principles is a wise procedure.



George Sheppard Bacon

Fifty-Eight Years in the Glass Industry

George Bacon was born in Bacon's Neck, near Greenwich, N. J., August 23, 1864, the son of Job Bacon, a farmer and canning-house operator, and Rachel Sheppard Bacon. He was educated in the Greenwich schools and attended the Westtown school. He married Rebecca Mulford of Millville in October, 1889.

Entering the employ of the Whitall Tatum Company in March, 1881, as an office boy in the Company's Philadelphia office at 410 Race Street, he was transferred to the Company's factory at Millville in November, 1881, where he worked as combination office boy and assistant cashier. He was made manager of the Glasstown or Upper Works July 1, 1892, and in July, 1897, was made general manager of both the Glasstown Works and the Lower or South Millville Works. He later served on the Board of Directors from 1910 until his retirement and was made vice-president of the Company October 27, 1936.

After the Whitall Tatum Company was purchased by the Armstrong Cork Company in 1938, Mr. Bacon continued as head of the Millville plant until April 1, 1939, when he retired and was succeeded by his son, J. Lawrence Bacon, the present general superintendent.

Upon his retirement, his associates at the Armstrong Cork Company tendered him a testimonial dinner.

Held Many Offices

Mr. Bacon was a director of the National Bottle Manufacturers Association from 1895 until it was merged with the Glass Container Association and served at various times as director, vice-president, secretary, and chairman of the managing committee of the latter organization. He held directorships in several railroad companies and in the Millville National Bank. He took an active part in the civic life of Millville and was a former president of the Millville Social and Athletic Association and a trustee of the Millville Hospital. He was a member of the Union League of Philadelphia, the Manufacturers Club of Philadelphia, and the Old Colony Club.

Besides his son, J. Lawrence, Mr. Bacon is survived by three daughters, Miss Elizabeth, at home, and Mrs. C. Ford Adams and Mrs. Chandler Burpee, both of Philadelphia. His wife died in 1929.

* From *Nat. Glass Budget*, **59** [48] 3, 9 (March 25, 1944) with supplementary information supplied by J. L. Bacon.

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NEED FOR CERAMIC ENGINEER

The Engineering and Industrial Experiment Station of the University of Florida is interested in obtaining the services of a qualified ceramic engineer for a full-time research position. The nature of the research project is that of the development of high-grade ceramic materials utilizing the raw materials available in the State of Florida.

Further information concerning this position may be obtained by writing to Professor R. A. Morgen, Engineering Experiment Station, University of Florida, Gainesville, Fla.

Meeting Mentor...

"Wine is known to improve with age and the same statement applies to Ross C. Purdy, General Secretary of The American Ceramic Society, who was here, there, and everywhere. He handled matters with tact, dispatch, and efficiency. While former members of The Society are familiar with his ability, there was an unusually large attendance of younger men just breaking into the ceramic field, who marveled at the efficient manner in which Ross performed his diversified and often trying duties." —*National Glass Budget, April 8, 1944.*

PORCELAIN ENAMEL IN THE POSTWAR ENAMEL INDUSTRY*

By Robert A. Weaver

I hope my first remarks will not lessen your confidence in what I say later. If you read your March 15th copy of *The Bulletin*, you noticed the program for today and pictures of the speakers. Unfortunately—or perhaps fortunately for me—they used my World War I picture. Having now been disillusioned on this score, you may rightfully have reservations regarding what I am about to say. If you have, I would not blame you.

To pile more fuel on the flames, Ross Purdy wrote under my picture, "For Biographical Sketch, see 'Bull' 1942." To offset that remark, I will try to stick strictly to facts today.

At the Cincinnati meeting of The Society in 1934, I read a paper the title of which was "An Ancient Art Becomes a Modern Industry." It is not necessary to go into the history of porcelain enamel today except to say that its origin is lost in antiquity and that we have many beautiful examples of the art that are more than a thousand years old.

The ancients not only wanted an outlet for their artistic urges, but they soon found that protective finishes were necessary for *objects of ordinary use* as well as objects of art. In the Orient, it is written that man developed colored pencils for decorative purposes as early as 4000 B.C. These were made by mixing pigments with clay.

Biblical quotations in the first book of the Bible (Genesis 6:14) and unearthed records of Egyptian excavations indicate the use of some kind of bitumen composition. It has been suggested that the coating materials used on mummies and cases were probably asphaltum dissolved in a volatile oil.

In the Far East, the natives had their lacquers. And our own Indians covered their canoes with a protective coating of black paint and decorated their faces with berry stains, colored clay, and charcoal made from red cedar.

So all through history we note the desire for color and the necessity for protective coatings. There has consequently always been a reward for those who could bring about in one finish a combination of color, beauty, and longer life. The last attribute has been most important because of the terrific toll taken of metal by corrosion.

As the less expensive metals came into general use, the importance of satisfactory finishes grew greater. They were needed to improve (1) resistance to corrosion and tarnish, (2) wearing properties or surface characteristics, and (3) appearance.

The factors which controlled the characteristics of the finishes were (1) dimension limits of machined parts, which controlled thickness, (2) adequacy of protection which also controlled thickness, (3) flexibility of parts, and (4) stability under special conditions, e.g., high temperatures, acid resistance, etc.

In general, protective coatings have to be applied to ferrous metals artificially. Roughly, the various types are (1) coatings of other metals applied by electrodeposition, (2) coatings of other metal applied by immersion, (3) conversion of the surface of the metal to one of its more resistant compounds, (4) spraying with a more resistant metal or alloy, (5) cementation, (6) cladding, (7) application of an organic coating, usually but not always a paint or lacquer, and (8) porcelain enameling.

Electrodeposition is the most commonly used process, and since 1840 we have plated with zinc, copper, nickel, tin, lead, etc. The characteristics of these coatings are smoothness and fineness of grain, irregularity in thickness according to shape of piece, a tendency to porosity unless process and solution are carefully controlled, and poor adherence unless the surface is carefully prepared.

The immersion coatings are the oldest and most familiar of the protective finish processes. The Romans coated copper vessels with tin, probably by immersion. The hot-dip tinning was a well-established art by the first part of the 17th century. About 1740, the first coating with hot-dipped zinc was made, and a few years later Sheffield plate was discovered.

The process is commercially practical only with low melting-point metals because of the undesirable effects of high temperatures on the metals being coated. The coatings are almost always relatively thick and consequently the process is wasteful of material. There seems to be no simple and inexpensive way of controlling accurate weights of application or distribution over the surfaces involved. There is a tendency for these coatings to develop brittleness. Generally speaking, coatings

* Presented at the Forty-Sixth Annual Meeting, The American Ceramic Society, Inc., Pittsburgh, Pa., April 3, 1944 (War Conference General Session). Received April 14, 1944.

electrodeposited or dipped do not have color or beauty and do not compare with porcelain enamel as a protective coating from a length-of-life standpoint.

Modern developments, accelerated by war shortages, have given the so-called surface-conversion materials a big boost, e.g., the phosphate coatings produced by the bonderizing and parkerizing processes. In general, they tend to be powdery on the surface, are highly absorbent, and have little corrosion resistance in themselves. They must be impregnated with dye, oil, wax, etc., to make them serviceable. They do make a good base for paints and are desirable in riveted assemblies because of the insolubility of the coating.

There are some coloring processes in this field of surface conversion which are suitable for decorative indoor service only. Chemical blacking, using alkali, nitrates, ureas, etc., are less expensive than the phosphate coatings, but not as satisfactory. Their corrosion resistance is negligible compared with porcelain enamel. Oxidized finishes, produced by temperature, are generally protected by a colorless lacquer and will withstand only mild service.

Metal sprayed coatings, a product of this century, are limited commercially to metals of low melting point and are usually used with zinc powder. They require a greater thickness of coating for the same measure of protection against corrosion and are particularly adaptable for use on large installations already in place. This same scheme has been tried, using porcelain enamel, but, though samples could be made, the idea is not yet commercial.

Cementation involves the use of powdered coatings and has wide metallurgical applications. It is also a product of this century. Sherardizing and calorizing are examples. They do not have color or beauty, but some of the products in this field have displayed excellent corrosion resistance.

Cladding, as its name indicates, is a veneering process, but it is reasonably expensive and does not appear to compete with porcelain enamel. Stainless steel and aluminum are usually used.

Last, but not least, we should briefly consider the organic finishes and the newer inorganic, but unfused, coatings. You are familiar with the popularity of the synthetic enamels, organic in nature. Because of the low temperature required they are suitable in places where porcelain enamel cannot be used. They are soft in comparison, however, and our Company, which makes both the synthetic and the real, generally speaking does not consider them to be competitive. The unfused inorganic material has a place during war time as a substitute for galvanizing but still has its spurs to win after the war.

Perhaps we have taken too long in considering the well-known finishes which have been generally known and available for years, but I wanted to show the wide variety of materials with which porcelain enamel has successfully competed in the past.

Some sage has said that the future can only be judged by the past, on which basis, in my opinion, porcelain enamel has nothing to fear from the finishes just mentioned.

But, you can properly say, "What about those materials which do not require finishes—the light metals, the plastics, and other products mentioned so often as substitutes for porcelain enamel in the dream world pictured for us by the designer, whose stock in trade is his imagination?"

Aluminum and stainless steel we know about. They will be cheaper in price, but so will porcelain enamel. They do not have the beauty and color we offer. They have been tried on most of the products where porcelain enamel has been used and have been found wanting. Magnesium has even less to offer.

Plastics—that is a name to conjure with. Automobiles, bathtubs, houses—everything will be made of plastics after the war. But they do not specify after which war. As a matter of fact, the feature writers have embarrassed the plastic producers with the fantastic claims which they have made for this thoroughly fine group of products.

The important men in the plastic industry have publicly announced that the designers have gone too far in their claims for the new products which will be produced from plastics.

In my opinion, the porcelain enameling industry, which gets its volume from the refrigerator, bathtub, range, washing-machine, and kindred industries, has absolutely nothing to fear from the finishes we have discussed or the new materials which have been ballyhooed so much in the last few years, IF—

And that "if" is in capitals. IF we do the job that is so clearly outlined for us to do.

And we are doing that job. G. H. McIntyre, head of Ferro's laboratories, last year in a paper presented before this Society, frankly listed the progress that had to be made in our industry if we were to keep pace with our opportunities. He ended his paper by saying, "The challenge is here. We accept it. We shall solve the problems."*

One of the problems was the reduction of fabrication costs. One of the suggested answers was the formulation of enamels which could be applied in one white or light-colored coating on the metal bases without a so-called ground or grip coat and with no loss of production standards.

I am happy to state that real progress has been made on that important problem during this last year. Final success will open up enormous new markets where inexpensive rustproofing, plus color, is required. Corrugated metal roofing and metal shingles are just two of the many items that can be produced economically when these new finishes are finally developed.

Their final development will probably be delayed until the steel manufacturers have perfected new base metals on which they are now diligently working. It is no secret, and it is certainly inspiring to know, that the steel manufacturers and the frit producers have been jointly working to make possible higher standards of quality, with lower costs, for the industry.

Dr. McIntyre further stated: "It appears that porcelain enamel (a new one developed for the purpose) under some specific conditions will outlast stainless steel many times." Here again, I would like to report that this new development has been brought to a successful conclusion during the last year. It is a finish for airplane exhaust

* See "A Free Industrial Enterprise Challenge," *Bull. Amer. Ceram. Soc.*, **22** [5] 153–55 (1943).

stacks which take a terrific beating at temperatures usually associated only with Hades.

We must remember, though our product has developed from an ancient art, that it is only in very recent years that volume has permitted the spending of enough money to do a really thorough research job. Another difficulty lay in the fact that until recent years there was no literature on the subject and research technicians had to be trained.

Those of you who have known the industry for the last twenty years will remember the hip-pocket enameler who inherited or bought a book of formulas and made his own enamels. In those days, three and four coats of white were the rule and epidemics of fish scale were common.

We have come a long way in a few years. And each year, as we learn more, we find more things that can be done with porcelain enamel.

Chipping has always been the great bugaboo in the industry. It was largely caused by a combination of too-heavy application (due to the large number of coats), poor design, careless application, and perhaps poor equipment and base metal.

Practically all of these causes for chipping have been eliminated and those that have not soon will be. As a matter of fact, chipping has not been a problem in recent years in the well-run shops. But the memory lingers on, especially among consumers.

It will take some time and much effort to sell the public on the fact that today's technically produced finish is as different from the old enamel as the modern refrigerator is from the old icebox. But this is a job we must do.

The prospects for our industry in the postwar era are the brightest in our history. Many things are combining to bring this about. As of today, our business comes largely from the materials applied to those fascinating and beautiful items which make American kitchens and bathrooms the pride of our homes and the envy of all the rest of the world.

Business seers and statisticians in the home-utility field agree that postwar sales of such products should reach phenomenal figures. In addition to the new buyers that have recently come into the market and the millions that have long wanted such products but never before could afford them, there are still other millions whose present equipment is worn out or obsolete and needs to be replaced. Together, they represent a potential demand that will test the capacity of all our present producers and tempt new ones into the field.

You must always remember that the prosperity of the porcelain enameling industry is closely tied to the producers of home-utility equipment, and they in turn are most prosperous when the building industry prospers.

All our trade and business papers and magazines have been printing the results of surveys indicating what the American public wants after the war. Automobiles come first, but homes, refrigerators, ranges, washing machines, etc., come high on the list. Remember also that, in addition to the huge replacement market for our products, the building of homes creates another large new market. Tomorrow's buyers will have the desire for porcelain enameled products and they will also have the money. They have paid their installment debts (have lots of brand-new credit), have money in the bank, and substantial amounts of War Bonds on hand. Watch them go to town when they get a chance to buy!

In addition, our production capacity is going to be burdened with demands for porcelain enamel from many new users. We have already discussed the bright future of the newly developed enamels for corrugated roofing, shingles, etc., and we also have a vast potential market in other architectural fields. The use of our materials for gas stations is now almost standard practice. Its use for store fronts, hospitals, schools, etc., was steadily growing before the war, and the demand is sure to increase after the war. All of the fine qualities of our material are useful in this field. Beauty, color, long life, low maintenance, cleanability, fireproofing—we have all the qualities they desire. Watch this field grow.

There is also a great and growing interest in the use of our material in the marine field. Here again, fireproofing, long life, low maintenance, and cleanability are desirable features. Bulkheads are now finished in our material, and other marine items are even now on the drafting board.

Even during the war the use of porcelain-enameled hot-water tanks to replace galvanized, copper, and Monel metal tanks has taken a long step forward. This is a big and logical field for porcelain enamel.

If *my* guess is any good, there is a strong probability that you will be buried in a stamped metal casket, rustproofed and beautifully finished in porcelain enamel. This, in turn, may be placed in a metal grave vault finished in the same manner. We may even put an enameled grave stone or marker over the grave for good measure. It has been done.

Let us sum up. We have a material proved through the ages. It is rustproof, beautiful, colorful, easy to clean, sanitary, heat resisting, low in cost, and getting better and cheaper all the time.

The industry is sold on research and scientific control. Its technical men are gradually taking over its management and sales. It is ambitious, determined, hard working, has vision, and is *confident* of the future.

In closing, I want to speak again of confidence. I opened my paper with reference to a possible lack of confidence. Now, I want to close on the opposite note. There is a story about the banker from the small town in Texas who was elected president of the American Banker's Association. When asked by a feature writer how he happened to go into the banking business he said, "We were all proud of our little town but didn't have a bank, so a friend of mine and I rented the only empty storeroom, put in a desk and counter, put a sign out in front, and waited for action. We got it. Our Chinese laundryman came in the first day and deposited $250. Soon after, a widow came in and left a similar amount. The next day our doctor put in $100, and the next day a nearby rancher deposited $500. By the end of the week my partner and I got some confidence in the bank and we both put in $50 each."

So, after years of talking, I have talked myself into real confidence in the future of porcelain enamel.

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(1944)

SURVEY OF THE LITERATURE ON PLASTICITY, VISCOSITY, AND ALLIED PROPERTIES*

By Paul G. Herold and W. J. Smothers†

Abstract

A search of the literature and a grouping of the methods used in various industries for measuring plasticity, consistency, and viscosity show that most of the industries have standardized on the measurement of viscosity. Industries such as the ceramic, paint, rubber, and cellulose industries are still attacking the problem of plasticity. Characteristic apparatus used in each industry for measuring rheological properties is described.

I. Introduction

Many industries have been concerned with the measurement of rheological properties of their products or material during manufacture. As far back as 1700, investigators started to work on viscosity, its measurement and explanation. In the ensuing years, a rather complete knowledge of viscosity has been gradually built up, especially through the work of Poiseuille.[63] ‡ After the measurement of viscosity was placed on a sound basis, the enormous field of viscosity of solids and semisolids was attacked. The first lucid differentiation between viscosity and plasticity was discussed by Maxwell.[55]

As plasticity is so closely related to viscosity, no differentiation was made between measurements, i.e., whenever plasticity was encountered, a viscometer was used to measure only the viscosity. These methods of measuring plasticity are generally agreed to be erroneous, although not much can be done about the question as the fundamental aspects have not been thoroughly explained.

Before discussing the various flow properties of fluids and solids, a definite understanding of the properties involved is necessary.

(1) Viscosity

A true fluid offers no permanent resistance to forces tending to change its shape; it yields steadily to the smallest deforming force. The rate of yielding, however, is different for different fluids, i.e., different fluids offer different transient resistances to deformation. This transient resistance is called internal friction or viscosity. Thus, a viscous liquid, such as glycerin or tar, flows more slowly through a tube or down an incline than does water, and such a flow consists in a continuous change of shape of each part of the liquid. The internal forces have been called stresses and, as the strain is a change of shape only, the stress must be a shearing stress.

(2) Fluidity

Viscosity takes into account the force necessary to overcome internal friction, whereas fluidity is a measure of the rate of flow with constant internal friction for the liquid. By definition, therefore, fluidity is the reciprocal of viscosity.

(3) Consistency

There is no scientific definition or discussion of this property, but it is referred to as a comparative state. It is sometimes considered to be the condition in which matter coheres so as to stand together or retain its form, i.e., a semiviscous and semifirm condition. Its use does not imply plasticity completely, but a property made up of "a lot of viscosity with a little bit of plasticity."

(4) Mobility

This term implies the flow of a plastic substance, whereas fluidity is related to the flow of a viscous substance. From this analogy, it cannot be said, however, that mobility is the reciprocal of plasticity.

(5) Plasticity

According to Bingham,[10] plasticity is a property of solids by virtue of which they hold their shape permanently under the action of small shearing stresses, but they are readily deformed, worked, or molded under somewhat larger stresses. Plasticity is thus a complex property made up of two independent factors which must be evaluated separately.

In contrast to this explanation, De Waele[22] believes that the two properties are related (or that there is only one property being measured) and that the plasticity curve can be expressed by a parabolic equation, the power representing the plasticity of the material. Liquids under normal shear have P/Q constant, whereas plastic bodies have P/Q^n constant, where P is the applied pressure, Q is the volume discharged from the viscometer, and n the exponent representing the degree of plasticity; n is always less than unity.

It therefore follows that a plastic substance will become a viscous fluid (even though it may retain its "solid" appearance) when $n = 1$. In clays or mixtures which owe their plasticity to clay, this change occurs when sufficient water is added to the material. De Waele's work[22] also shows why there is no sharply defined demarcation between a soft plastic clay and a slip made from it by the addition of water.

There has been considerable controversy between the two schools of thought on the subject of plasticity as represented in Bingham's and De Waele's work. Two curves

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‡ Numbers refer to Bibliography, pp. 187–88.

which are representative of the two ideas are shown in Fig. 1. The extrapolation of the mobility portion of the Bingham curve to the pressure axis indicates what he calls the "yield value" of the material. The curved portion between the two regimes of the Bingham curve is explained on the basis of slippage of the material as a solid plug, as shearing and slippage are both taking place. De Waele states that the regime of slippage is not confined to this small portion of the curve and that the upper portion, usually assumed to be a straight line, is not straight but is slightly curved because of the small amount of slippage taking place at high pressures. Both investigators contend that the other has not used high enough values of pressure to exclude slippage, as the measurement of the shear is the criterion. Blair[12] gives a more lucid explanation of the flow curve based on Bingham's hypothesis. When the plastic material is introduced into the capillary, a water envelope is assumed to lie between the body of the material and the walls of the capillary. The flow of the constituent parts and the type of flow are dependent upon the pressure. Figure 2, taken directly from his book, explains the different parts of the flow curve.

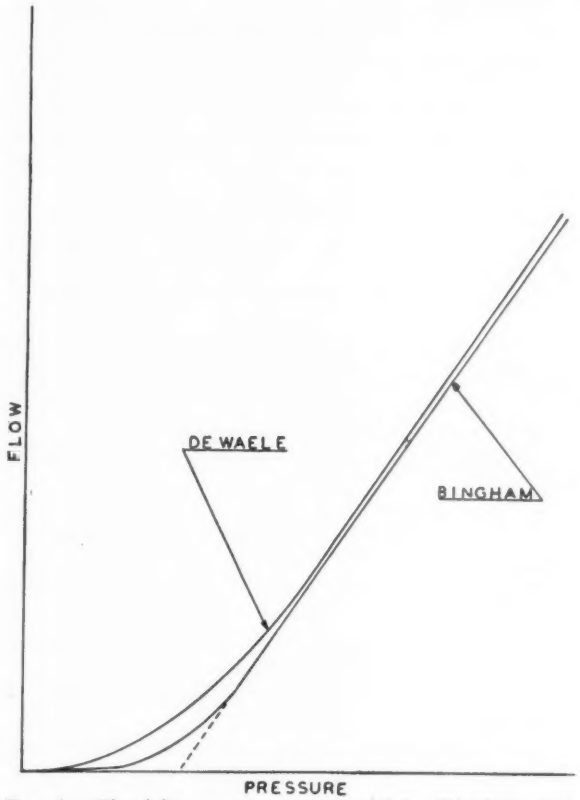

FIG. 1.—Plasticity curves as proposed by Bingham and De Waele.

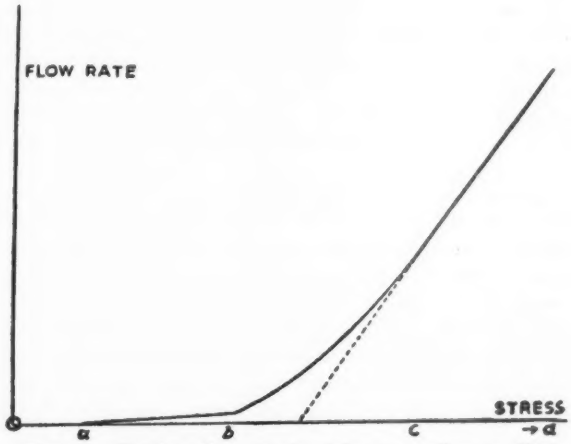

FIG. 2.—Explanation of plasticity according to Blair. *Oa*, no flow, as the pressure is less than the yield value of the water envelope; *ab*, plug flow (flow being linear with pressure); *bc*, curvilinear mixed flow; *cd*, rectilinear streamline flow.

II. Efflux-Type Instruments

This type of instrument has found the most favor in industry and research for measuring the flow properties of materials. Bingham states the following advantages: (1) It is susceptible of simple mathematical treatment; (2) it is rapid; (3) only a small amount of fluid is required; (4) it can be used under the widest variety of conditions of temperature, pressure, etc.; (5) the preliminary measurements and adjustments are easy to make; (6) it has been tested thoroughly and found to be capable of the highest degree of precision.

The efflux capillary viscometer is used almost exclusively by the oil industry and is also usually used to measure the viscosity of gases (Rankine's). The Ostwald viscometer is the instrument generally accepted for measuring viscosity of liquids. Most of the instruments of this type devised to measure consistency, mobility, plasticity, and fluidity may also be used to measure viscosity. A list of the better known capillary-type viscometers is given in Table I.

TABLE I

EFFLUX INSTRUMENTS USED*

Barbet (67)	Marzetti (54)
Baume-Vigneron (7)	Ostwald-Fenske (30)
Belani (9)	Pagliani (28)
Bingham (11)	Parlow (59)
Couette (efflux type) (27)	Poiseuille (63)
Dallwitz-Wegner (17, 18)	Rankine (64)
Damm-Kerperson (42)	Redwood (65)
Determann (20)	Rouse - Shearer (plastometer) (72)
De Waele (22)	Roussi-Peakes (60)
Dillon (23)	Sauerwald (69)
Dubrisay (24)	Saybolt (43)
Engler (26)	Tagliabue (2)
Faxwell (46)	Tehar (66)
Fisher (32)	Teschner (74)
Gibson (38)	Troshenskiĭ (76)
Gregory (plastometer) (41)	Ubbelohde (77)
Hadfield-Bawtree (8)	Vogel-Ossag (57)
Hess (44)	Washburn (82)
Klever (49)	Zeitfuchs (85)
Lidstone (51)	
Mariotte (53)	

* The reference given for each instrument is generally the original description of the apparatus, and when possible the author is the person after whom the instrument is named.

III. Stokes-Type Instruments

About 1851, Stokes[73] published a theoretical calculation of the viscous resistance offered by fluids to the motion of solid bodies of various shapes. He was interested directly

in the pendulum corrections due to air resistance. One of the important problems solved was the resistance to motion of a sphere falling through a viscous fluid of indefinite extent.

For transparent fluids, this method of measurement has many advantages. Visual observation can be employed in measuring the velocity, corrections for variations in densities of the fluids used can be kept small by employing sphere materials that have a high density, and measurements can be made with the fluids subjected to mechanical pressure.

The serious drawbacks are (1) the necessity of using small spheres for materials of low viscosity and (2) the limited range of any one choice of size of sphere and size of containing vessel. At low velocities, convection currents in the fluid might seriously affect the accuracy of the determination.

The falling-ball viscometer has been favored as a research apparatus to investigate viscous materials such as molten salts, syrup, and molten glass. A list of modifications of this type of instrument is given in Table II.

TABLE II
STOKES INSTRUMENTS USED

Atreco (4)	Gibson (37)
Doelter-Sirk (79)	Höppler (45)
Fischer (31)	Lawaczeck (50)
Fischer-Bauer (6)	Steiner (21)
Gardner (34)	Wolff (84)

IV. Torsion-Type Instruments

To Coulomb[15] belongs the credit for putting the laws of the resistance of fluid motion on the firm basis of proved experimental fact. For his tests, he employed first a cylinder and later a disk suspended by a fine wire and oscillating in the liquid to be examined. Satisfactory results have been obtained with this method, but it has been difficult to keep the inner rotating member equidistant from the outer vessel.

The rotation of a disk has been used, though principally for the measurement of the viscosity of gases. The oscillating-cylinder type, however, has also been used for viscous materials at room temperatures. A list of instruments of this type is given in Table III.

TABLE III
TORSION INSTRUMENTS USED

Clark (14)	Margules (29)
Couette (25)	Obermayer (75)
Coulomb (15)	Pochettino (62)
Crosby (16)	Spindler-Hoyer (3)
Davis (plastometer) (19)	Staněk (68)
Doolittle (39)	Stormer (1)
Geisler (plastometer) (36)	Vogel (80)
Kämpf (47)	Volarovich (81)
MacMichael (52)	

Two other types of instruments might be considered to be in this main classification: one which embodies a compression of the plastic mass with attendant deformation and the other which involves a compression accompanied by a shearing action. The latter has found favor in measuring plastic properties of clays. The instruments used are listed in Table IV.

TABLE IV
INSTRUMENTS INVOLVING COMPRESSION AND SHEARING ACTION

Atterberg (5)	Mellor (56)
Brabender (amylograph) (13)	Mooney (58)
Brownian movement (33)	Pfefferhorn (61)
Garner (35)	Scott (70, 71)
Green (40)	Williams (83)
Karrer (48)	Vicat (needle) (78)

V. Classification of the Literature

The enormous work which has been pursued in research on the subject of flow of liquids and solids can readily be comprehended by an examination of the literature. Bingham[10] lists approximately 2750 references covering the literature from 1700 to 1921. The present search has revealed a total of 1360 more references up to 1941.

Various industries are interested in the subject of viscosity and plasticity. For convenience these have been listed as follows:

(1) Oil and grease (crude oil and products refined from it).

(2) Food (a wide field covering liquids, such as milk and syrup, to such solids as edible greases and dough).

(3) Metallurgy (slags and internal friction of metals).

(4) Concrete (cements, mortars, and plasters).

(5) Coal (green solids, heated plastic solids, and molten ash).

(6) Tar and asphalt.

(7) Paint (varnish and oil paint, including those containing pigments).

(8) Rubber (crude and purified rubber and rubber cements).

(9) Chemistry (gas, solutions, organic fluids including blood and serum, cellulose, resins, and colloidal solutions).

(10) Ceramics (glass, raw clay, soils, drilling mud, and enamel slips).

(11) Instruments (includes only those articles which describe an instrument for measuring viscosity or plasticity and its standardization).

The literature in so many fields foreign to ceramics was investigated to obtain a complete picture of the general aspects of plasticity. It was felt that some industry other than ceramics might have vital information which would help in the solution of the problem of plasticities of clays.

The measurement of viscosity has been worked out in great detail and is highly standardized. Absolute units have been developed for viscosity and check well for various instruments.

Consistency measurements are used only in the cement, food, tar, and paint industries to any great extent. The oil industry measures the consistency of oil at low temperatures, which leads to the belief that oil might be a plastic material, although from the standpoint of viscosity measurements it is assumed to be a true liquid. In each case, the most popular instrument embodies some feature of a penetration test to measure consistency. Other instruments used to some extent are various torsion machines and various flow testers, the Vicat needle being the most used.

Next to viscosity, plasticity is the most important property encountered in industrial processes. The only industry which makes little or no mention of plasticity is the

petroleum, oil, and grease industry. Table V gives a résumé of the industries and indicates the type of instrument used in each. Apparently the general method most used for measuring plasticity is the Bingham plastometer. The rubber industry, which is somewhat akin to ceramics in measurement of flow properties, seems, however, to prefer the Williams compression apparatus.

TABLE V

Industries	Type of Instrument Used
Food	Bingham plastometer, penetration tests, electric torsional machine,* compression
Coal	Davis and Geisler plastometer, penetration
Concrete	Vicat needle
Metallurgy	Pendulum oscillation, U-tube efflux
Tar and asphalt	Compression
Paint	Bingham plastometer
Rubber	Bingham plastometer, Williams compression apparatus
Chemicals	Bingham plastometer, MacMichael, electric torsional machine,* Höppler (for colloids)
Ceramics	Bingham plastometer, compression, indirect properties, Atterberg, Shearer plastometer, penetration

* Machine which has a paddle powered by an electric motor. The resistance of the sample to the turning of the paddle is measured by the electrical input.

Mobility is a property which is generally supposed to be one of the independent properties of plasticity. It has been little investigated as a distinct property. Three instruments are ordinarily used, viz., the Irving consistometer, the Gardner mobilometer, and the Bingham plastometer.

As yet, no instrument has been devised to meet fully the requirements of the various industries which measure plasticity. Before an entirely satisfactory instrument is devised, some of the fundamental aspects of plasticity should be investigated.

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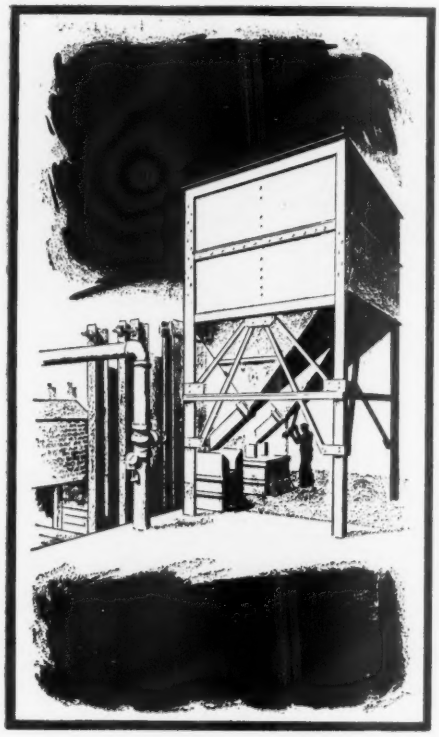

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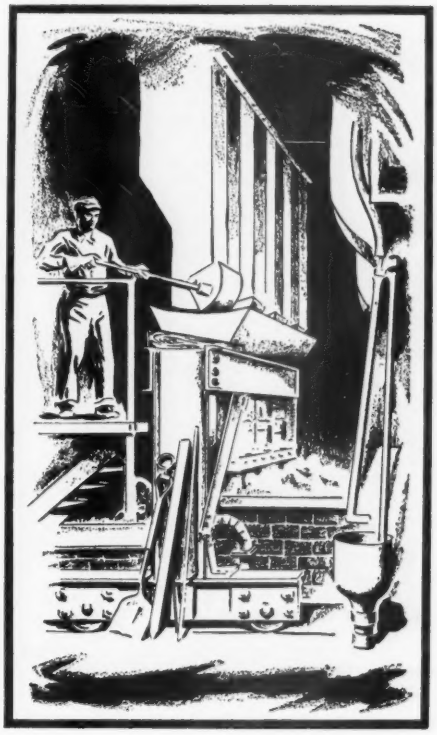

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Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Pennsylvania Salt Mfg. Co.
Vitro Mfg. Co.

Crystolon (Refractory Products)
Norton Co.

Cullet, Washing Plants, Incinerators, Crushers
Frazier-Simplex, Inc.

Cutters (Bar)
Industrial Ceramic Products, Inc.

Decorating Supplies
Drakenfeld, B. F., & Co., Inc.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Vitro Mfg. Co.

Disintegrators
Lancaster Iron Works, Inc.

Dryer (Pipe Rack)
Lancaster Iron Works, Inc.

Dryers (Waste Heat, Continuous and Batch Type)
Harrop Ceramic Service Co.

Drying Machinery
Frazier-Simplex, Inc.
Lancaster Iron Works, Inc.

Electrocast Refractories
Corhart Refractories Co.

Enamelers' Borax
Pemco Corp.

Enameling Equipment (Complete)
Frazier-Simplex, Inc.
Hommel, O., Co., Inc.
Vitro Mfg. Co.

Enameling Furnaces
Carborundum Co.
Hommel, O., Co., Inc.
Lancaster Iron Works, Inc.
Norton Co.

Enameling Iron (Sheet)
American Rolling Mill Co.

Enameling Muffles
Carborundum Co. (*Carbofrax*)
Frazier-Simplex, Inc.
Norton Co. (*Alundum*)

Enameling (Practical Service)
Hommel, O., Co., Inc.
Metal & Thermit Corp.
Pemco Corp.
Titanium Alloy & Mfg. Co.
Vitro Mfg. Co.

Enamels
Drakenfeld, B. F., & Co., Inc.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Pemco Corp.
Vitro Mfg. Co.

Enamel Oxide
Drakenfeld, B. F., & Co., Inc.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.

Enamels (Porcelain)
Hommel, O., Co., Inc.
Pemco Corp.
Titanium Alloy & Mfg. Co.
Vitro Mfg. Co.

Engineering Service
Harrop Ceramic Service Co.

Equipment (Porcelain Enameling)
Hommel, O., Co., Inc.

Feldspar
Du Pont de Nemours, E. I., & Co., Inc. Electrochemicals Dept.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Maxson, Elwyn L.
Pemco Corp.
Vitro Mfg. Co.

Filter Fabrics
Metakloth Company

Fire Brick
Carborundum Co.
Corhart Refractories Co.
Electro Refractories & Alloys Corp.
Norton Co.

Fire Brick—Process Equipment
Lancaster Iron Works, Inc.

Fire Clay
Great Lakes Foundry Sand Co.
Spinks, H. C., Clay Co.

Flint
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Great Lakes Foundry Sand Co.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Maxson, Elwyn L.
Pemco Corp.

Flint Pebbles
Hommel, O., Co., Inc.
Vitro Mfg. Co.

Floors (Non-Slip)
Norton Co.

Fluorspar
Harshaw Chemical Co.
Hommel, O., Co., Inc.

French Flint
Maxson, Elwyn L.

Frit
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Pemco Corp.
Titanium Alloy & Mfg. Co.
Vitro Mfg. Co.

Frosting Mixtures
Drakenfeld, B. F., & Co., Inc.
Harshaw Chemical Co.
Hommel, O., Co., Inc.

Fuel Oil Systems and Control Stokers
Frazier-Simplex, Inc.
Harrop Ceramic Service Co.

Furnaces
Carborundum Co. (*Carboradient*)
Frazier-Simplex, Inc.
Harrop Ceramic Service Co.
Hommel, O., Co., Inc.
Swindell-Dressler Corp.

Furnaces, Enameling
Swindell-Dressler Corp.

Gauges, Draft (Recording, Indicating)
Leeds & Northrup Co.

Gauges, Pressure
Leeds & Northrup Co.

Glass Bending Ovens, Glass Decorating Machines
Frazier-Simplex, Inc.

Glass Equipment
Lancaster Iron Works, Inc.

Glass Melting Tanks and Furnaces
Frazier-Simplex, Inc.

Glass Sand
Great Lakes Foundry Sand Co.

Glass Thickness Gauge
Bausch & Lomb Optical Co.

Glaze and Body Spar
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Maxson, Elwyn L.
Pemco Corp.
Vitro Mfg. Co.

Glazes and Enamels
Drakenfeld, B. F., & Co., Inc.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Harshaw Chemical Co.
Hommel, O., Co., Inc.

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Pemco Corp.
Titanium Alloy & Mfg. Co.
Vitro Mfg. Co.

Glaze Spar
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Maxson, Elwyn L.

Goggles
Hommel, O., Co., Inc.

Gold
Drakenfeld, B. F., & Co., Inc.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Vitro Mfg. Co.

Gold Decorations
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Hommel, O., Co., Inc.

Granulators
Lancaster Iron Works, Inc.

Grinding Wheels
Carborundum Co. (*Carborundum and Aloxite*)
Electro Refractories & Alloys Corp.
Norton Co. (*Alundum-Crystolon*)

Hearths
Carborundum Co. (*Carbofrax* heat treating)
Corhart Refractories Co.
Norton Co. (*Crystolon*)

Hearths (High Aluminous Clay, Electrically Sintered Aluminum Oxide, Silicon Carbide)
Carborundum Co.
Norton Co.

Hydrofluoric Acid
Harshaw Chemical Co.
Hommel, O., Co., Inc.

Iron Chromite
Harshaw Chemical Co.

Iron (Enameling)
American Rolling Mill Co.

Iron Oxide
Drakenfeld, B. F., & Co., Inc.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Foote Mineral Co.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Pemco Corp.
Vitro Mfg. Co.

Kaolin
Hammill & Gillespie, Inc.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Maxson, Elwyn L.
United Clay Mines Corp.
Vitro Mfg. Co.

Kilns, China (Decorating)
Drakenfeld, B. F., & Co., Inc.
Frazier-Simplex, Inc.
Harrop Ceramic Service Co.
Hommel, O., Co., Inc.
Swindell-Dressler Corp.

Kilns (Electric, Circular, Tunnel)
Ferro Enamel Corp.
Harrop Ceramic Service Co.
Swindell-Dressler Corp.

Kiln Furniture (Silicon Carbide, Semi-Silicon Carbide) (Refractory)
Carborundum Co.
Electro Refractories & Alloys Corp.
Ferro Enamel Corp.

Kryolith (see Cryolite)
Pennsylvania Salt Mfg. Co.

Laboratory Ware
Norton Co.

Lehr Tile (High Aluminous Clay, Electrically Sintered Aluminum Oxide, Silicon Carbide)
Carborundum Co.
Electro Refractories & Alloys Corp.

Lehrs
Frazier-Simplex, Inc.
Swindell-Dressler Corp.

Lehrs (Electric or Fuel Heated)
Frazier-Simplex, Inc.
Swindell-Dressler Corp.

Lehr Loaders
Frazier-Simplex, Inc.

Linings (Furnace Refractory, Block Refractory Plate, Brick, and Tile)
Carborundum Co.
Corhart Refractories Co.
Electro Refractories & Alloys Corp.
Norton Co.
Vitro Mfg. Co.

Lithium Carbonate
Drakenfeld, B. F., & Co., Inc.
Foote Mineral Co.

Lithium Minerals
Foote Mineral Co.

Magnesia (Fused)
Electro Refractories & Alloys Corp.
Norton Co.

Magnesia (Sintered, Calcined)
Drakenfeld, B. F., & Co., Inc.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Pemco Corp.

Magnesite
Drakenfeld, B. F., & Co., Inc.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Foote Mineral Co.
Hammill & Gillespie, Inc.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Vitro Mfg. Co.

Magnesite Calcined
Foote Mineral Co.
Hommel, O., Co., Inc.

Magnesium Carbonate
Drakenfeld, B. F., & Co., Inc.
Harshaw Chemical Co.
Hommel, O., Co., Inc.

Manganese
Drakenfeld, B. F., & Co., Inc.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Hammill & Gillespie, Inc.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Vitro Mfg. Co.

Manganese Dioxide
Drakenfeld, B. F., & Co.
Foote Mineral Co.

Manganese (Oxide)
Corhart Refractories Co.
Drakenfeld, B. F., & Co., Inc.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Harshaw Chemical Co.
Hommel, O., Co., Inc.

Masks (Breathing)
Drakenfeld, B. F., & Co., Inc.

Metals (Porcelain Enameling)
American Rolling Mill Co.

Micronized Products
Pemco Corp.

Microscopes (Polarizing)
Bausch & Lomb Optical Co.
Spencer Lens Co.

Microscopes (Stereoscopic)
Bausch & Lomb Optical Co.
Spencer Lens Co.

Minerals
Drakenfeld, B. F., & Co., Inc.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Foote Mineral Co.
Hammill & Gillespie, Inc.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Vitro Mfg. Co.

Mixers
Clearfield Machine Co.

Mixers (Batch)
Clearfield Machine Co.
Lancaster Iron Works, Inc.

Mixers (Concrete, Paving, Road Paving, Plaster, Asphalt, Truck, Mortar, Bituminous)
Lancaster Iron Works, Inc.

Mixers (Laboratory)
Lancaster Iron Works, Inc.

Mold Sanders
Lancaster Iron Works, Inc.

Muffles (Furnace) (Laboratory)
Carborundum Co. (*Carbofrax*)
Electro Refractories & Alloys Corp.
Frazier-Simplex, Inc.
Norton Co.

Mullers (Batch)
Clearfield Machine Co.
Lancaster Iron Works, Inc.

Muriatic Acid
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Pennsylvania Salt Mfg. Co.

Needle Antimony
Foote Mineral Co.
Harshaw Chemical Co.
Hommel, O., Co., Inc.

Nepheline Syenite
Great Lakes Foundry Sand Co.

Nickel Salts
Drakenfeld, B. F., & Co., Inc.
Harshaw Chemical Co.
Hommel, O., Co., Inc.

Nitrates (Cobalt, Sodium)
Drakenfeld, B. F., & Co., Inc.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Vitro Mfg. Co.

Nitre
Harshaw Chemical Co.
Hommel, O., Co., Inc.

Norbide (Norton Boron Carbide)
Norton Co.

Olivine
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.

Opacifiers
Drakenfeld, B. F., & Co., Inc.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Metal & Thermit Corp.
Pemco Corp.
Pennsylvania Salt Mfg. Co.
Titanium Alloy & Mfg. Co.
Vitro Mfg. Co.

Overglaze Colors
Drakenfeld, B. F., & Co., Inc.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Ferro Enamel Corp.

Oxides
Drakenfeld, B. F., & Co., Inc.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Ferro Enamel Corp.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Metal & Thermit Corp.
Pemco Corp.
Titanium Alloy & Mfg. Co.
Vitro Mfg. Co.

Palladium Decorations
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Hommel, O., Co., Inc.

Pans—Wet and Dry
Clearfield Machine Co.

Pins
Hommel, O., Co., Inc.
Industrial Ceramic Products, Inc.
Potters Supply Co.

Placing Sand
Great Lakes Foundry Sand Co.
United Clay Mines Corp.

Platinum Decorations
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Hommel, O., Co., Inc.

Polariscopes
Bausch & Lomb Optical Co.
Frazier-Simplex, Inc.

Porcelain Enameling Service (Practical)
American Rolling Mill Co.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Ferro Enamel Corp.
Hommel, O., Co., Inc.
Pemco Corp.
Titanium Alloy & Mfg. Co.
Vitro Mfg. Co.

Porcelain Enamels
Ferro Enamel Corp.
Hommel, O., Co., Inc.
Pemco Corp.
Titanium Alloy & Mfg. Co.
Vitro Mfg. Co.

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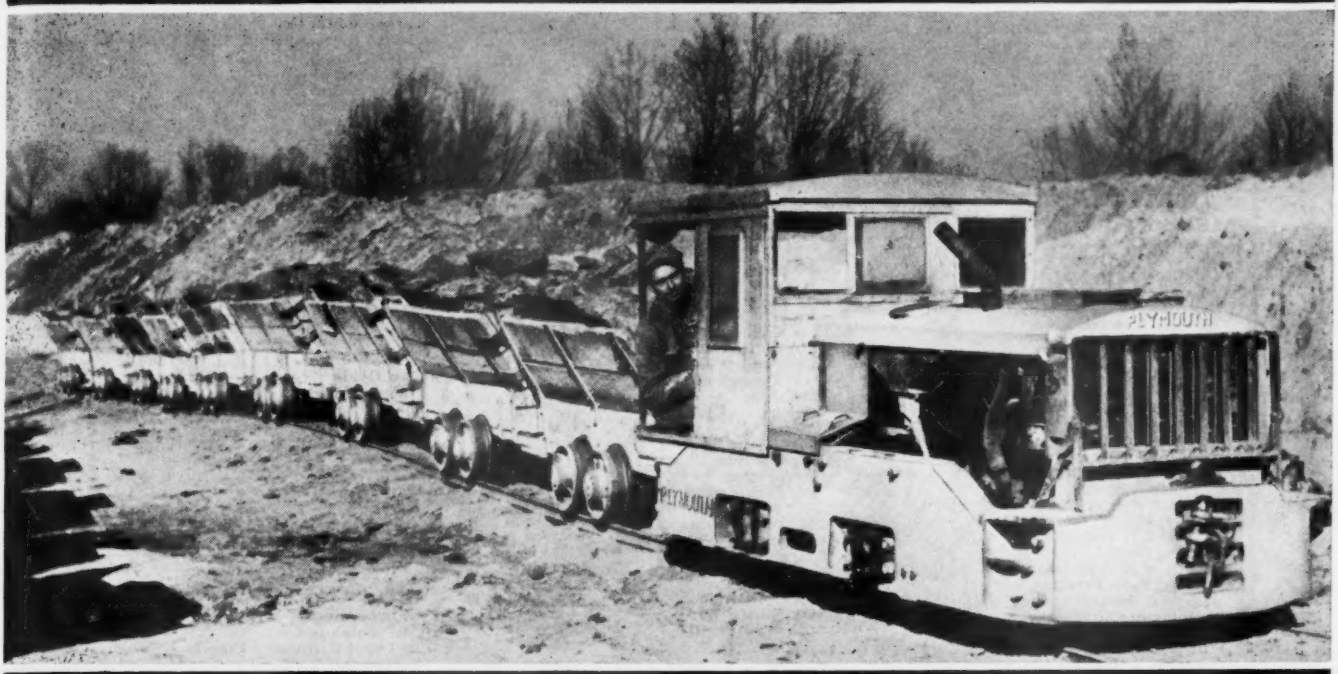

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Harshaw Chemical Co.
Hommel, O., Co.,Inc.
Vitro Mfg. Co.

Producer Glass Plants
Frazier-Simplex, Inc.

Pug Mills
Lancaster Iron Works, Inc.

Pyrites (Natural Iron Sulphide)
Foote Mineral Co.
Hommel, O., Co., Inc.

Pyrometer Tubes
Carborundum Co.
Leeds & Northrup Co.
Montgomery Porcelain Products Co.

Pyrometer Tubes (Refractory and Hard Porcelain)
Electro Refractories & Alloys Corp.
McDanel Refractory Procelain Co.
Montgomery Porcelain Products Co.
Norton Co.

Pyrometers (Optical, Radiation, Surface, Immersion, Needle)
Leeds & Northrup Co.

Pyrometric Cones
Edward Orton, Jr., Ceramic Foundation

Raw Material Handling Equipment
Frazier-Simplex, Inc.
Lancaster Iron Works, Inc.

Recorders, CO_2
Leeds & Northrup Co.

Recorders, Draft
Leeds & Northrup Co.

Recorders, Tank Pressure
Leeds & Northrup Co.

Refractometers
Bausch & Lomb Optical Co.
Electro Refractories & Alloys Corp.
Spencer Lens Co.

Refractories
Carborundum Co.
Corhart Refractories Co.
Electro Refractories & Alloys Corp.
Norton Co.

Refractory Materials
Carborundum Co.
Corhart Refractories Co.
Electro Refractories & Alloys Corp.
Norton Co.
Titanium Alloy & Mfg. Co.

Respirators
Drakenfeld, B. F., & Co., Inc.
Hommel, O., Co., Inc.

Rutile
Drakenfeld, B. F., & Co., Inc.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Foote Mineral Co.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Metal & Thermit Corp.
Orefraction, Inc.
Vitro Mfg. Co.

Saggers
Carborundum Co.
Electro Refractories & Alloys Corp.
Norton Co.
Potters Supply Co.

Salt Cake
American Potash & Chemical Corp.
Drakenfeld, B. F., & Co., Inc.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Pennsylvania Salt Mfg. Co.

Sandblast Sand
Great Lakes Foundry Sand Co.

Sand Grinders and Sifters
Lancaster Iron Works, Inc.

Saponin
Hommel, O., Co., Inc.

Selenite of Sodium
Drakenfeld, B. F., & Co., Inc.
Hommel, O., Co., Inc.
Vitro Mfg. Co.

Selenium
Drakenfeld, B. F., & Co., Inc.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Foote Mineral Co.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Vitro Mfg. Co.

Sheets (Enameling Iron)
American Rolling Mill Co.

Silica (Fused)
Electro Refractories & Alloys Corp.
Foote Mineral Co.
Hommel, O., Co., Inc.

Silicate of Soda
Harshaw Chemical Co.
Hommel, O., Co., Inc.

Silicon Carbide
Carborundum Co.
Electro Refractories & Alloys Corp.
Norton Co.

Silicon Carbide Firesand
Carborundum Co.

Sillimanite Refractories
Electro Refractories & Alloys Corp.

Slabs (Furnace)
Carborundum Co.
Electro Refractories & Alloys Corp.
Norton Co.

Soda Ash
American Potash & Chemical Corp.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Pennsylvania Salt Mfg. Co.
Vitro Mfg. Co.

Sodium Antimonate
Drakenfeld, B. F., & Co., Inc.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Metal & Thermit Corp.
Vitro Mfg. Co.

Sodium Fluoride
Drakenfeld, B. F., & Co., Inc.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Vitro Mfg. Co.

Sodium Metasilicate
Harshaw Chemical Co.

Sodium Nitrite
Harshaw Chemical Co.
Hommel, O., Co., Inc.

Sodium Silica Fluoride
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Harshaw Chemical Co.
Hommel, O., Co., Inc.

Sodium Uranate
Drakenfeld, B. F., & Co., Inc.
Harshaw Chemical Co.
Hommel, O., Co., Inc.

Soot Blowers
Frazier-Simplex, Inc.

Special Machines
Frazier-Simplex, Inc.

Spar
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Maxson, Elwyn L.
Vitro Mfg. Co.

Spray Booths
Hommel, O., Co., Inc.

Spraying Equipment
Hommel, O., Co., Inc.

Spurs
Potters Supply Co.

Stacks
Lancaster Iron Works, Inc.

Steel Plate Construction
Lancaster Iron Works, Inc.

Stilts
Hommel, O., Co., Inc.
Industrial Ceramic Products, Inc.
Potters Supply Co.

Sulfur
Stauffer Chemical Co.

Sulfuric Acid
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Pennsylvania Salt Mfg. Co.
Stauffer Chemical Co.

Talc
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Hammill & Gillespie, Inc.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
International Pulp Company

Tanks
Frazier-Simplex, Inc.

Tank Blocks
Corhart Refractories Co.

Tanks (Pickle)
Hommel, O., Co., Inc.

Tanks for Raw Material Steel or Concrete
Lancaster Iron Works, Inc.

Tile (Floor)
Norton Co.

Tile (Muffle)
Carborundum Co.
Electro Refractories & Alloys Corp.
Norton Co.

Tile (Refractory)
Carborundum Co., (*Carbofrax*)
Electro Refractories & Alloys Corp.
Norton Co.

Tin Oxide
Drakenfeld, B. F., & Co., Inc.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Hommel, O., Co., Inc.
Metal & Thermit Corp.
Vitro Mfg. Co.

Titanium
Drakenfeld, B. F., & Co., Inc.
Foote Mineral Co.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Titanium Alloy & Mfg. Co.
Vitro Mfg. Co.

Titanium Oxide
Drakenfeld, B. F., & Co., Inc.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Foote Mineral Co.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Metal & Thermit Corp.
Titanium Alloy Mfg. Co.
Vitro Mfg. Co.

Trisodium Phosphate
Harshaw Chemical Co.

Trucks
Lancaster Iron Works, Inc.

Tubes (Insulating)
Carborundum Co.
McDanel Refractory Porcelain Co.
Norton Co.

Tubes (Pyrometer)
Carborundum Co.
Electro Refractories & Alloys Corp.
Leeds & Northrup Co.
McDanel Refractory Porcelain Co.
Montgomery Porcelain Products Co.
Norton Co.

Uranium Oxide
Drakenfeld, B. F., & Co., Inc.
Harshaw Chemical Co.
Hommel, O., Co., Inc.

Uranium Oxide (Yellow-Orange-Black)
Drakenfeld, B. F., & Co., Inc.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Hommel, O., Co., Inc.
Vitro Mfg. Co.

Water Softening Plants
Frazier-Simplex, Inc.

Wet Enamel
Hommel, O., Co., Inc.
Pemco Corp.
Titanium Alloy & Mfg. Co.
Vitro Mfg. Co.

Whiting
Drakenfeld, B. F., & Co., Inc.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Hammill & Gillespie, Inc.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Vitro Mfg. Co.

Winding Drums
Lancaster Iron Works, Inc.

Zinc Oxide
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Vitro Mfg. Co.

Zircon
Foote Mineral Co.
Hommel, O., Co., Inc.

Zirconia
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Foote Mineral Co.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Metal & Thermit Corp.
Titanium Alloy & Mfg. Co.
Vitro Mfg. Co.

Zirconium Oxide
Foote Mineral Co.
Hommel, O., Co., Inc.
Titanium Alloy Mfg. Co.

Zirconium Silicate and Ultrox
Metal & Thermit Corp.

Zirkite (Natural ZrO_2)
Foote Mineral Co.

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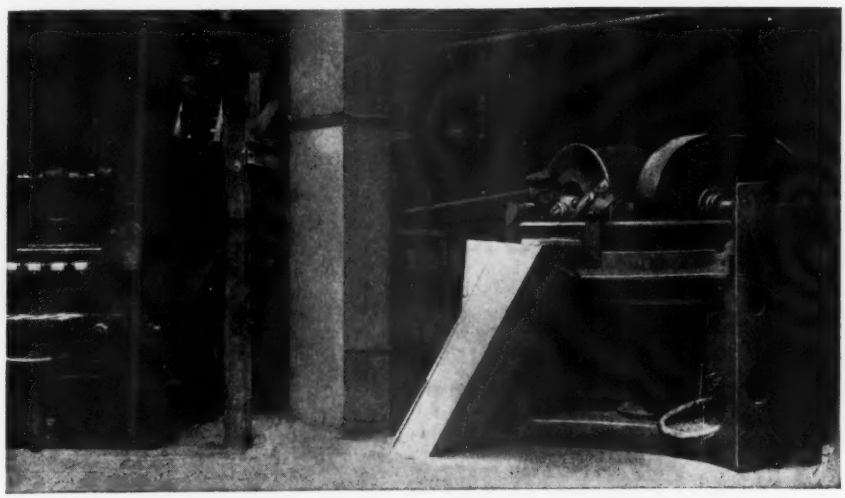

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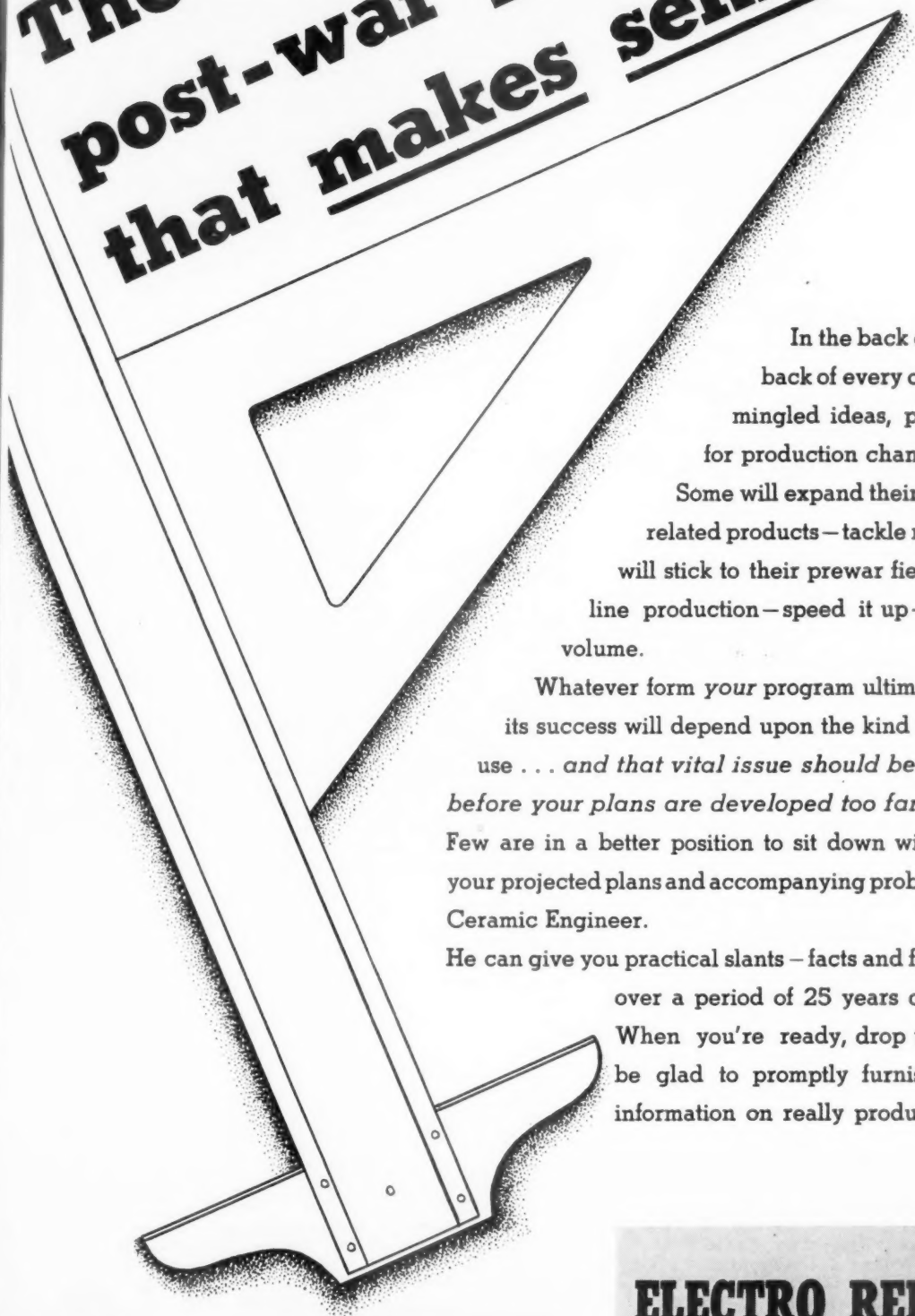

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